THE REGULATION OF INDUSTRIAL TOXIC AND HAZARDOUS EMISSIONS IN ONTARIO AS COMPARED WITH SELECTED JURISDICTIONS

VOLUME 1
SUMMARY AND CONCLUSIONS

JANUARY 1990

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Volume 1

Summary and Conclusions

Report prepared for:
Policy and Planning Branch

Report prepared by:
James F. Hickling Management Consultants Ltd.

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1.0 PURPOSE

The purpose of this study was to determine whether or not Ontario's proposed regulations of its industries' toxic effluents and emissions constitute a competitive disadvantage for industries in the Province. Will these regulations, in particular MISA and the proposed amendments to Regulation #308, force Ontario's industries to lose market share, move elsewhere, or cancel expansion plans for their Ontario operations?

The approach taken to answer this question was to compare the current and anticipated industrial toxics regulations of Ontario with the regulations of selected other jurisdictions. The comparison was done from three perspectives: the extent of toxics regulation in the selected jurisdictions; the enforcement of these regulations; and the estimates of the economic impacts of these regulations on the affected industry sectors.

The study was focused in the following three important ways.

- The jurisdictions selected for comparison were Quebec and Alberta, a set of 12 American States and six OECD countries.
- Priority was placed on the comparisons between Ontario and the other Canadian and United States jurisdictions.
- Nine industry sectors were focused upon as those most likely to bear the heaviest burden under Ontario's regulatory initiatives being considered.

2.0 FINDINGS AND CONCLUSIONS

Tables #1, 2 and 3 following this executive summary present the findings of our comparison. We summarize below the main conclusions resulting from these findings.

2.1 THE REGULATORY SETTINGS

- All of the jurisdictions examined are in the midst of major changes in their regulation and regulatory enforcement of the toxic effluents and emissions of industries. This complicates the task of comparing the various regulatory approaches, as all of them are changing simultaneously. It is not always obvious what regulations will result nor when any such regulations will be promulgated.
- However, all the jurisdictions are moving, and sometimes dramatically so, in the direction of increasing regulation of industry's toxic pollutants. The various agencies involved in developing the regulatory approaches are copying liberally from each and share information freely.

2.2 ONTARIO VS. QUEBEC AND ALBERTA

- All three jurisdictions have a variety of regulations and licensing processes that impose pollutant controls at specific plants. The emphasis to date has been on the so-called "conventional" pollutants such as pH, suspended solids, and biological oxygen demand (BOD).

- Ontario's current regulations result in inconsistent treatment of pollutants, including toxics, among plants in the same sector and across sectors. Quebec's regulations are similar. Alberta's current approach to permitting, monitoring and reporting is more stringent than that of either Ontario or Quebec.

- All the Provinces are in the midst of major overhauls of their regulation of air and water toxics. Ontario is much further advanced than the other two Provinces in identifying the specific toxics likely to be regulated and in setting preliminary schedules for regulations.

- Ontario's MISA program has identified 179 parameters, including toxic chemicals, likely to be regulated across the nine priority industry sectors. The proposed amendments to Regulation #308 identify 100 toxic substances that might be regulated.

- Neither Quebec nor Alberta is yet at this advanced stage. However, Quebec has announced publicly a major commitment to environmental protection through its new "Industrial Waste Reduction Program". This program focuses on many of the same sectors that would be regulated under MISA and Regulation #308. While details are still being worked out in government-industry committees, we understand that the Quebec program is being based on both Ontario's approach and the approaches of other jurisdictions that figured in the design of the Ontario model. The Quebec approach will be a technology-based one, as in Ontario, but with greater emphasis on the introduction of clean technologies. In our view, if the Quebec government maintains its current momentum it is conceivable that Quebec will introduce controls of toxic pollutants in the same time horizon being considered for MISA and Regulation #308. Quebec's stated target date for introducing toxics regulations is 1992. The specific toxics to be regulated have not yet been identified.

- Alberta is at an earlier stage, and is just developing a process for identifying priority pollutants.

- Ontario's enforcement approach is believed to be much more stringent than that of Quebec. Quebec's new enforcement approach is being modeled, in part, on that of Ontario.

- Quebec is moving towards a "one-stop shopping" approach in its pollution regulation. All regulations and all media will be covered by the "depollution attestation" certificate which will be required. This may simplify the task of compliance on the part of firms.

2.3 ONTARIO VS. THE UNITED STATES

- In the U.S., air and water toxics have received different regulatory treatments at the hands of the Environmental Protection Agency (EPA) and are discussed separately.

Water

- For U.S. industries, the EPA has established effluent limits on 126 water-borne toxics (called "priority pollutants") since 1982 for some sectors. These regulations are based on Best Available Technology (BAT-EA). Thus, to the extent that these effluent regulations have been a financial burden to U.S. industries, the Ontario industries have had a competitive advantage over their U.S. competitors during this period.

- However, in our judgment the U.S. experience has been that the costs to U.S. industry of complying with the EPA's current water-borne toxics regulations have not been significant (see Table #3). The one possible exception to this conclusion is the organic chemicals sector, which may be facing significant capital costs to comply with the regulations.

- Ontario's MISA program is in the pre-regulating stage of monitoring the effluents of the major direct dischargers. In all, 179 chemicals are being monitored. The large majority of the EPA's regulated toxics are also on the MISA list. It is highly likely that the EPA's BAT-EA limits will be the minimum levels of control to be specified in the eventual MISA regulations. MISA may impose even more stringent effluent limits, given its stated goal of achieving the "virtual elimination of toxic contaminants in municipal and industrial discharges into waterways."

  Whether or not these future MISA effluent limits will constitute a competitive disadvantage will depend upon the limits set and the costs of achieving them. To date, no estimates have been prepared of the costs to Ontario industries for complying with the eventual MISA regulations.

- U.S. industries are also facing more stringent regulations of their toxic pollutants. Regulations on receiving water quality standards are to be developed during 1989, with enforcement beginning in 1992. These limitations will be in addition to the BAT-EA effluent limits already in force.

- On a per capita basis, Ontario spends three times as much on enforcement as does the U.S. EPA.

Air

- Ontario's proposed amendments to Regulation #308 would cover more chemicals more stringently than comparable programs in the U.S.. To date, the EPA has regulated only seven toxic air substances, far short of the 100 being considered by Ontario. The States have filled this void,

proceeding independently. New York has set ambient air quality levels for over 250 toxics, used as guidelines to set permit levels. Massachusetts has ambient standards for over 100 air toxics, also used in the permitting process.

Some U.S. experts judge that, within two years, the U.S. Federal government will establish a list of air pollutants for which control requirements will have to be set. One piece of legislation in the House of Representatives identifies 187 air toxics to be controlled. Another draft in the Senate directs that 11 specific chemicals are to be controlled within 18 months, with a further 213 chemicals to be controlled within 10 years. Both of these lists cover more chemicals than does Regulation #308.

General

- All of these jurisdictions are operating, to date, on the "polluter pays" principle whereby the industries creating the pollutants are expected to pay the costs of abatement. Thus, there is no competitive advantage in any jurisdiction from this perspective.

- Firms operating in Canada, however, have a significant advantage over their U.S. counterparts in the federal government's accelerated capital cost allowance that the Canadian firms are permitted on their purchases of equipment for purposes of pollution abatement and control. U.S. companies have no such comparable program. In our judgment, the tax-free industrial development bonds available in the U.S. do not compare in impact on the affected companies.

2.4 ONTARIO VS. OECD COUNTRIES

- Further research is required to reach definitive conclusions about competitive advantages that might exist between Ontario and OECD jurisdictions as a result of differential regulation of industry's toxic effluents and emissions. However, two tentative conclusions can be reached.

    - The water toxics regulations of the European Community nations appear to be less stringent than those in place in the U.S. and being considered for Ontario.

    - Japan's regulations of both air and water toxics appear to be considerably more stringent than those in place in Ontario, as is Japan's enforcement regimen.

3.0 OVERALL CONCLUSIONS

- A detailed comparison of regulations leading to conclusion on competitive advantage is difficult because of the many and complex changes taking place in the toxics regulations of all the jurisdictions.

- In our view, all the jurisdictions examined will continue to introduce ever-more stringent regulation of industries' toxic pollutants. The call for this increased stringency is being seen by governments to come directly from the electorate.

  The degree of information exchange among the regulating agencies makes it, in our judgement, unlikely that the technical toxics regulations themselves will bestow a significant competitive advantage in a jurisdiction, beyond timing considerations that will arise as the various governments introduce their regulations according to their own time-tables. In our judgment, there will be a tendency for the jurisdictions to "leap-frog" each other, building on the most current technical knowledge, with the level of regulation increasing across all of the jurisdictions.

TABLE #1: THE EXTENT OF REGULATION OF HAZARDOUS AND TOXIC SUBSTANCES

JURISDICTION	TOTAL # OF CHEMICALS REGULATED	HOW REGULATED			
		EFFLUENT/ EMISSION LIMITS	BAT-EA	AMBIENT QUALITY STANDARDS	TOXICITY
I. CANADA					
1. FEDERAL	CEPA o Covers both water and air releases of toxics. o Schedule I of CEPA identifies 9 toxic chemicals and groups of chemicals that are regulated. o Parts I and II of Schedule III list 7 classes of prohibited substances and 16 individual and classes of restricted substances. o In addition, there are 44 chemicals, groups of chemicals, and classes of effluents identified in the "CEPA Priority Substances List", and as such will probably be regulated within the mandatory five-year period. Some of the entries on this list are general, e.g., "effluents from pulp mills using bleaching". Many of the substances are on the MISA list also.	o Not yet determined.			
2. ONTARIO	2.1 CURRENT o Current regulations result in inconsistent treatment of pollutants, including toxics, among plants in the same sector and across sectors.				

TABLE #1: THE EXTENT OF REGULATION OF HAZARDOUS AND TOXIC SUBSTANCES

JURISDICTION	TOTAL # OF CHEMICALS REGULATED	NOW REGULATED			
		EFFLUENT/ EMISSION LIMITS	BAT-EA	AMBIENT QUALITY STANDARDS	TOXICITY
	2.2 FUTURE				
	2.2.1 MISA				
	o The results of the MISA monitoring phase will determine the parameters to be regulated and the effluent limits to be established.	o Yes; not yet set.	o Probably, using EPA and updated information.	o Uncertain.	o Whole-effluent toxicity tests will probably continue to be required.
	o 179 priority pollutants have been identified and are being monitored for a one-year period. The extensive consultation process prior to establishing the monitoring program suggests that parameters being monitored likely will end up being regulated.				
	o 7 sectors have monitoring programs in place or in draft form.				o Yes, during monitoring phase.
	o Pulp and Paper o 137 parameters.				
	o Iron and Steel o 142-153 monitoring parameters.				
	o Organic Chemicals o 137 toxics and 15 conventional parameters.				
	o Inorganic Chemicals o 133 toxics and 18 conventional parameters.				
	o Metal Casting o 12 site-specific monitoring plans for up to 162 toxics and conventional parameters.				

TABLE #1: THE EXTENT OF REGULATION OF HAZARDOUS AND TOXIC SUBSTANCES

JURISDICTION	TOTAL # OF CHEMICALS REGULATED	HOW REGULATED			
		EFFLUENT/ EMISSION LIMITS	BAT-EA	AMBIENT QUALITY STANDARDS	TOXICITY
	o Minerals o Group A: all 179 MISA priority pollutants, less six groups unlikely to be found in the effluent. o Petroleum Refining o 113 monitoring parameters. 2.2.2 REG. 308 o One hundred substances have been identified as potentially being subject to regulation.	o Probably.	o Probably, using EPA and other updated information.	o Ambient standards may be imposed in addition to discharge limits.	o No.
3. QUEBEC	3.1 CURRENT o Like Ontario, Quebec does not have regulations for specific toxic pollutants. The effluents and emissions of the sectors of interest are subject to various Acts and regulations, some of which refer to specific substances. There are no permitting requirements, neither are specific control technologies referred to in the regulations. Reporting and monitoring requirements are minimal.				

TABLE #1: THE EXTENT OF REGULATION OF HAZARDOUS AND TOXIC SUBSTANCES

JURISDICTION	TOTAL # OF CHEMICALS REGULATED	HOW REGULATED			
		EFFLUENT/ EMISSION LIMITS	BAT-EA	AMBIENT QUALITY STANDARDS	TOXICITY
	3.2 FUTURE				
	o Quebec's new "Industrial Waste Reduction Program" (IWRP) is a dramatic change to the current situation. Six sectors have been selected for focus: pulp and paper, mines, metallurgy, chemicals, oil and surface coverings. The IWRP is designed to ". . . quickly eliminate the major pollutant loads discharged into the water, air and salt by big industry . . . .". Standards for toxic wastes are expected to begin to be introduced in 1992.	o Yes.	o Standards to be based on BAT-EA. These technologies will be treatment technologies normally involving waste reduction through process changes. Esphasis is on clean technologies.	o Unknown.	o Probably.
4. ALBERTA	4.1 CURRENT				
	<u>Clean Water Act</u>				
	o Petroleum refineries.	o Average allowable concentrations.	o Best practicable technology (BPT), which is defined in the regulations.	o No.	o Yes.
	o Lead smelters.	o For each process.			
	<u>Clean Air Act</u>			o Yes.	
	4.2 FUTURE				
	o In January, 1988, a review panel published "An Action Plan For Environmental Law Enforcement in Alberta". Recommended: o a list of priority pollutants be developed;				

TABLE #1: THE EXTENT OF REGULATION OF HAZARDOUS AND TOXIC SUBSTANCES

JURISDICTION	TOTAL # OF CHEMICALS REGULATED	HOW REGULATED: EFFLUENT/ EMISSION LIMITS	HOW REGULATED: BAT-EA	HOW REGULATED: AMBIENT QUALITY STANDARDS	HOW REGULATED: TOXICITY
	o ambient air standards be replaced with ". . . objectives for a number of contaminants."; o ambient standards for watersheds be developed.				
II. UNITED STATES					
1. FEDERAL	1.1 CURRENT				
WATER TOXICS	o 126 toxic chemicals have been regulated by the EPA.	o Yes.	o Yes; NSPS for new sources.	o No, but under development or States may add (see 'FUTURE' below).	o No, but under development or States may add.
	o By sectors: Pulp & Paper - 3 chemicals, all 3 are on NISA list. Iron & Steel - 8 chemicals, all 8 are on NISA list. Petroleum Refining - 2 chemicals, both are on NISA list. Organic Chemicals - 63 chemicals, 54 on the NISA list. Inorganic Chemicals - 13 chemicals, 12 on the NISA list.				

JURISDICTION	TOTAL # OF CHEMICALS REGULATED	NOW REGULATED: EFFLUENT/ EMISSION LIMITS	NOW REGULATED: BAT-EA	NOW REGULATED: AMBIENT QUALITY STANDARDS	NOW REGULATED: TOXICITY
	Industrial Minerals - 1 chemical, not on the NISA list. Electric Power - 108 chemicals, 93 on the NISA list. Ore Mining - 8 chemicals, all 8 on the NISA list. **1.2 FUTURE** o EPA and States now devising water-quality based standards emphasizing toxics. Standards are to be developed by 1989, with compliance by 1992.				
	1.3 CURRENT				
AIR TOXICS	o Only 7 toxics have been regulated by the EPA. Future regulations will probably impose technology-based standards.	o Yes.	o No.	o No.	o No.
	1.4 FUTURE o Some U.S. experts expect within two years an EPA list of air toxics to be controlled. Two drafts of legislation are now in the House and the Senate: o the House bill identifies 187 air toxics to be controlled; o the Senate bill lists 11 chemicals to be controlled within 18 months, and 213 chemicals to be controlled within 10 years. Both lists cover more chemicals than does Ontario's proposed Regulation #308 list.				

TABLE #1: THE EXTENT OF REGULATION OF HAZARDOUS AND TOXIC SUBSTANCES

JURISDICTION	TOTAL # OF CHEMICALS REGULATED	HOW REGULATED			
		EFFLUENT/ EMISSION LIMITS	BAT-EA	AMBIENT QUALITY STANDARDS	TOXICITY
2. STATES					
WATER TOXICS	o Four States (New York, New Jersey, Michigan, and California) have augmented EPA regulations and are comparable to NISA coverage. o Other States are catching up, but may take up to 10 years.	o Yes.	o Yes.	o In places.	o In places.
AIR TOXICS	o States are proceeding independently to regulate toxics; many are acting without benefit of regulations. o California, Georgia, Colorado, Louisiana, New Jersey, Texas, New York, and Massachusetts have lists of pollutants, but lists are neither inclusive nor exclusive.	o Yes.	o In part.	o Yes.	o No.
	o New York has set ambient levels for 250 air toxics, which are used as guidelines in establishing permit levels.	o Yes.	o Yes.	o Yes.	o No.
	o Massachusetts has ambient levels for 100 air toxics.	o Yes.	o No.	o Yes.	o No.
	o California now developing regulations for a test of air toxics. o Only three States (New Jersey, California, and Michigan) use a technology-based approach. The others base control on specific risk assessments or ambient guidelines.	o Yes.	o Lowest achievable level.	o Yes.	o No.

TABLE #2: ENFORCEMENT OF REGULATIONS

JURISDICTION	ENFORCEMENT PROVISIONS	FIVE-YEAR TREND IN: # OF PROSECUTIONS FOR VIOLATIONS	FIVE-YEAR TREND IN: TOTAL $ VALUE OF FINES	PUBLIC POLICY ON ENFORCEMENT
CANADA				
FEDERAL GOVERNMENT	o CEPA provides for penalties of fines, jail sentence, Court orders, and combinations of these. o Enforcement and Compliance Division monitors compliance with a staff of about 60.	o 1986-87: 4 o 1987-88: 9	not available	o The pattern in the past has been to negotiate compliance. This is changing towards stricter enforcement. o The Minister issued a public pamphlet in May, 1988, announcing the new enforcement approach. o Enforcement could be delegated to the Provinces as part of the "equivalency" agreements allowed for under CEPA.

ONTARIO	o Fines go up to $250,000. per day, $500,000 for repeats.
	o Jail terms can be imposed.
	o Investigations and Enforcement Branch established in 1985:
	  o about 100 staff, including 54 investigators;
	  o budget of $4.3 million.
		o 1985-86: 86
		o 1986-87: 179
		o 1987-88: 211
		o 1988-89: 244
			o average fine in 1980: $2,000.
			o average fine in 1987: $8,700.
			o total fines in 1988/89: $2 million in 176 convictions.	

QUEBEC	o Prior to the recent IWRP, there was little enforcement in Quebec. Warnings were issued, but rarely followed up. o Inspections Branch of the MOE established in Fall, 1988, now recruiting and training; intend to have 20 investigators and 20 inspectors. Inspectors will have broad powers.	not available	not available	o The "Industrial Waste Reduction Program" is a major initiative of the Government. Increased enforcement is identified as a major component of it. o Quebec officials state that one of their goals is to achieve at least as high a quality of enforcement as in Ontario, despite the smaller staff complement.
ALBERTA	o Alberta places emphasis on ongoing monitoring. Permits require monitoring and reporting of readings that are above license limits. o No specific enforcement branch, and therefore no estimates of resources allocated to enforcement. o Enforcement handled by the Pollution Control Division with a staff of about 40, including 10 inspectors.	not available	not available	o The discussion paper calls for more attention to enforcement.

TABLE #2: ENFORCEMENT OF REGULATIONS

JURISDICTION	ENFORCEMENT PROVISIONS	FIVE-YEAR TREND IN # OF CONCLUDED CASES OF WATER VIOLATIONS (includes States' actions on behalf of EPA)	FIVE-YEAR TREND IN TOTAL $ VALUE OF FINES (thousands of current US $)	PUBLIC POLICY ON ENFORCEMENT
UNITED STATES				
FEDERAL EPA	o Federal EPA enforces Federal BAT standards unless enforcement agreement is struck with individual States. o Five-year trend in EPA water enforcement budget: 1984: $ 27933 1985: $ 31867 (% Change 14.08) 1986: $ 35483 (% Change 11.35) 1987: $ 37641 (% Change 6.08) 1988: $ 37435 (% Change -0.55) o The above estimates include EPA transfers to States that enforce Federal regulations, but do not include the additional States' expenditures on enforcement. o Environmental groups are bringing citizens' suits against major dischargers to force more rapid compliance. o Air toxics account for 29% of EPA air enforcement cases; the rest are for conventional pollutants.	o 1984: 23 o 1985: 36 o 1986: 32 o 1987: 45 o 1988: 73	o 1984: 693 o 1985: 3419 o 1986: 3280 o 1987: 5303 o 1988: 8140	o Reviews by the U.S. General Accounting office have concluded that enforcement by EPA is behind schedule, that the regulations have loopholes, and that resources are inadequate to the task. It is uncertain how, or if, the government will respond to this.

TABLE #2: ENFORCEMENT OF REGULATIONS

JURISDICTION	ENFORCEMENT PROVISIONS	FIVE-YEAR TREND IN # OF CONCLUDED CASES OF WATER VIOLATIONS (includes States' actions on behalf of EPA)	FIVE-YEAR TREND IN TOTAL $ VALUE OF FINES (thousands of current US $)	PUBLIC POLICY ON ENFORCEMENT
STATES	o Anecdotal information obtained as follows: o California - $20 million budget for water toxics control; - 275 person-years spent on water toxics. o Colorado - 80 people assigned to water supply and wastewater; - issues about 40 violation notices per year, fines total about $100,000. o Georgia - no specific budget for water toxics. o Illinois - 10-15 person-years assigned to water toxics; - 95% of industrial dischargers are in compliance. o Louisiana - administered by EPA. o Maine - State water toxics budget of $60,000; - administered by EPA.			

TABLE #2: ENFORCEMENT OF REGULATIONS

JURISDICTION	ENFORCEMENT PROVISIONS	FIVE-YEAR TREND IN # OF CONCLUDED CASES OF WATER VIOLATIONS (includes States' actions on behalf of EPA)	FIVE-YEAR TREND IN TOTAL $ VALUE OF FINES (thousands of current US $)	PUBLIC POLICY ON ENFORCEMENT
	o Massachusetts - administered by EPA; - State budgets 5 person-years and $250,000 for water toxics; - only 48% of State's water meets use standards.			
	o Michigan - for 1986-87, 54 staff and $2.1 million budgeted for water toxics.			
	o New Jersey - water pollution control program includes toxics; annual budget of $16 million and staff of 295.			
	o New York - annual budget for water toxics control is $9 million, staff of 120.			
	o Tennessee - annual budget of $6 million, 15-20 staff for water toxics; - annual value of fines is $500,000-$1,000,000.			
	o Texas - administered by EPA; - State spends about $600,000 annually on water toxics.			

TABLE #3: COSTS AND ECONOMIC IMPACTS OF REGULATIONS

JURISDICTION	TYPES OF COSTS ESTIMATED	ESTIMATES BY SECTORS (Canadian costs are in millions of 1988 dollars)	MEASURES OF IMPACTS OF COSTS
I. CANADA			
1. ONTARIO		A) IRON & STEEL	
MISA	o costs of general and sector-specific monitoring requirements.[1] o no estimates yet of eventual MISA compliance costs.	MISA o total capital and 1-year operating costs: $0.03-$2.8 per plant.	o total costs are 0.6% of average capital expenditures. o after-tax profits down by 0.2%-2.6% per company, if no pass-through of costs. o impacts on sector judged to be "small in relation to aggregate sectoral financial indicators."
Reg. 308	o both the ongoing monitoring and the compliance costs have been estimated under various scenarios.	Reg. 308[2] o uniform annual cost of capital and operating costs: $2.1-$3.0 per plant.	o as a % of value-added of sector: 1%-3.8%. o impacts judged to represent a significant drop in return on investment.
	As above	B) PULP & PAPER MISA o total capital and 1-year operating costs: $0.18-$1.5 per plant.	o 9 kraft mills bear 50% of costs. o one mill faces high costs; others range from $0.16-$0.65. o monitoring costs ranged from 0.5%-8.4% of after-tax profits; most were less than 1.5%. o impacts on sector judged "not to burden significantly any of the firms for which data were available" and ". . . do not appear to have any effect on the international competitiveness of these firms."
		Reg. 308 (kraft pulp mills) o uniform annual cost of capital and operating costs: $0.39-$0.50 per plant.	o costs are about 0.5% of selling price per tonne, about 1.8% of profit. o impact of costs judged to be not significant.

[1]Note that some of the MISA studies on monitoring costs are still in draft form, and the results may change.

[2]The economic study of Reg. 308 examined a range of possible regulations. Costs presented here are the upper and lower limits.

TABLE #3: COSTS AND ECONOMIC IMPACTS OF REGULATIONS

JURISDICTION	TYPES OF COSTS ESTIMATED	ESTIMATES BY SECTORS (Canadian costs are in millions of 1988 dollars)	MEASURES OF IMPACTS OF COSTS
		C) ORGANIC CHEMICALS	
	As above	MISA	
		o total monitoring capital and 1-year operating costs: $0.1-$2.5 per plant.	o capital costs are 0.5%-1.1% of sector average annual capital expenditures. o sector studied has been in loss position during 1982-1986. Monitoring costs would have increased losses by 5%. o authors conclude that ". . . the imposition of monitoring costs will not pose an undue financial or economic burden on those firms for which data were available."
		Reg. 308	
		o uniform annual cost of capital and operating costs: $0.79-$1.47 per plant.	o costs are judged to be possibly a significant burden on the sector; data were too aggregated to permit a definitive conclusion.
		D) INORGANIC CHEMICALS	
	As above	MISA	
		o total monitoring capital and 1-year operating costs: $0.04-$0.59 per plant.	o per plant costs range from $0.05-$1.38. o monitoring costs represent 0.3%-5.4% of average annual capital expenditures. o impacts on annual average after tax profits range from 0.5%-10%. o impacts on the sector judged to be "small in relation to aggregate industry financial indicators."
		Reg. 308 ("other chemical products" sector)	
		o uniform annual cost of capital and operating costs: $0.1-$0.19 per plant.	o no definitive conclusion; data too aggregated.

TABLE #3: COSTS AND ECONOMIC IMPACTS OF REGULATIONS

JURISDICTION	TYPES OF COSTS ESTIMATED	ESTIMATES BY SECTORS (Canadian costs are in millions of 1988 dollars)	MEASURES OF IMPACTS OF COSTS
	As above	**E) METAL CASTING** **MISA** o total monitoring and 1-year operating costs: $0.008-$0.5 per plant. **Reg. 308 ("rolled castings" sector)** o uniform annual cost of capital and operating costs: $0.15-$0.17 per plant.	o 25% of the plants account for 87% of expenditures. o costs are up to 2.4% of average annual capital expenditures. o impacts are judged to be financially manageable. o compliance costs could take up to 4.8% of the value-added; judged to be potentially significant.
	As above	**F) MINING** **MISA** o total monitoring capital and 1-year operating costs: $0.2-$0.4 per plant. **Reg. 308** o no comparable study carried out on this sector.	o costs represent 0.3%-1.5% of sector total capital investment. o impacts of costs judged not to be significant.
	As above	**G) INDUSTRIAL MINERALS** **MISA** o study still in draft. **Reg. 308** o no comparable study carried out on this sector.	

JURISDICTION	TYPES OF COSTS ESTIMATED	ESTIMATES BY SECTORS (Canadian costs are in millions of 1988 dollars)	MEASURES OF IMPACTS OF COSTS
	As above	H) PETROLEUM REFINING MISA o total capital and 1-year operating costs: $0.430-$0.620 per plant. Reg. 308 o uniform annual cost of capital and operating costs: $2.2-$4.5 per plant.	o the capital costs are a small proportion of each company's historical annual capital expenditures for petroleum products. o oil industry reported to view these costs as "a necessary cost of doing business." o compliance costs represent a significant portion of profit. o costs would have very serious consequences for the industry.
	As above	I) ELECTRIC POWER GENERATION MISA o study still in preparation. Reg. 308 o no comparable study carried out on this sector.	
2. ALBERTA	o costs not estimated.		
3. QUEBEC	o some compliance costs have been estimated by government, but not made public. o "polluter pays" principle will guide the Quebec program.		

TABLE #3: COSTS AND ECONOMIC IMPACTS OF REGULATIONS

JURISDICTION	TYPES OF COSTS ESTIMATED	ESTIMATES BY SECTORS (U.S. costs given in millions of 1985 U.S. dollars)[3]	MEASURES OF IMPACTS OF COSTS
II. UNITED STATES			
1. FEDERAL GOVT. (EPA)			o % of sector value-added taken up by all water pollution control (i.e., toxics and conventionals).
WATER TOXICS	o annual capital and operating costs for BAT-EA water toxics compliance.	A) IRON & STEEL (including metal casting)	
		o BPT=$52.5, BAT=$22.8; Total=$75.3.	o 2.5%, judged to be insignificant.
		B) PULP & PAPER	
		o BPT=$2.91,[4] BAT=0; Total=$2.91.	o 4.4%, judged to be insignificant (excluding dioxins).
		C) ORGANIC CHEMICALS	
		o BPT=$75.8, BAT=$222.0; Total=$297.8.	o 4%; capital costs for toxics may reach 8% of total annual capital expenditures; may be significant.
		D) INORGANIC CHEMICALS	
		o BPT=$2.0, BAT=$22.5; Total=$24.5.	o 2.7%; judged not to be significant.
		E) MINING	
		o no cost impacts.	
		F) INDUSTRIAL MINERALS	
		o no cost impacts.	
		G) PETROLEUM REFINING	
		o no cost impacts.	
		H) ELECTRIC POWER GENERATION	
		o no cost impacts.	

[3] BPT = Best Practicable Technology, aimed at conventional pollutants but captures some toxics also.
BAT = BAT-EA = Best Available Technology-Economically Achievable: costs of toxics control required in addition to BPT.

[4] For three groups of chemicals only, not including dioxins.

TABLE #3: COSTS AND ECONOMIC IMPACTS OF REGULATIONS

JURISDICTION	TYPES OF COSTS ESTIMATED	ESTIMATES BY SECTORS (U.S. costs given in millions of 1985 U.S. dollars)	MEASURES OF IMPACTS OF COSTS
AIR TOXICS	o limited EPA attention to air toxics has resulted in few cost estimates. o a 1987 paper by the Congressional Budget Office made cost estimates for comprehensive changes to the Clean Air Act. Total costs were estimated to be $2.1-$13.8 billion (U.S.). These costs were judged to be "quite small" when compared to value of shipments of the affected sectors.		
2. STATES' GOVTS.			
WATER TOXICS	o use EPA estimates.		
AIR TOXICS	o only California has estimated compliance costs for some of its chemical-specific regulations. e.g., hexavalent chromium control measures on cooling towers will cost $2.1 million in capital and $2 million annually in operating costs.		
GOVERNMENT TAX AND SUPPORT PROGRAMS			
1. CANADA	o The accelerated capital cost allowance for pollution abatement and control (PABCO) expenditures is a significant advantage compared to other jurisdictions. The Federal Sales Tax on PABCO equipment is removed for manufacturers.		

TABLE #3: COSTS AND ECONOMIC IMPACTS OF REGULATIONS

JURISDICTION	TYPES OF COSTS ESTIMATED	ESTIMATES BY SECTORS (U.S. costs given in millions of 1985 U.S. dollars)	MEASURES OF IMPACTS OF COSTS
2. ONTARIO	o Manufacturers do not have to pay the 8% Provincial Sales Tax on PABCO equipment.		
3. QUEBEC	o Manufacturers do not have to pay the 9% Provincial Sales Tax on PABCO equipment.		
4. ALBERTA	o There is no Provincial Sales Tax.		
5. U.S. FEDERAL	o No significant programs. Most that are available are aimed at small businesses.		
6. U.S. STATE	o Tax-exempt industrial development bonds enable firms to get money at slightly below market rates. States' ability to use these bonds is capped.		

PART I

INTRODUCTION

1.0 BACKGROUND AND PURPOSE

1.1 BACKGROUND

In pursuit of environmentally sound economic development in Ontario, the Ontario Ministry of the Environment has recently developed a number of policy initiatives in the area of environmental protection. Two major initiatives which would result in the establishment of more stringent standards on effluents and emissions released into the environment are:

- the Municipal Industrial Strategy for Abatement (MISA) which aims to achieve the "virtual elimination of toxic contaminants in municipal and industrial discharges into waterways"[1]; and

- proposed revisions to Regulation 308 of the Environmental Protection Act to impose "direct emission limits on all air pollution sources of any appreciable size."[2]

The basic initiatives of the proposed MISA program involve the:

- "development and promulgation of regulations which specify monitoring and effluent limits that are based on the best available control technology (BACT) that is economically achievable;

- development of effluent limits based on water quality impacts; and

- implementation of abatement and enforcement activities to ensure that specific abatement program schedules and deadlines are met."[3]

The priority objective of the MISA program is to reduce the discharges of about 300 industrial plants and mines identified as the major direct industrial dischargers, and the 400 municipal sewage treatment plants in the Province.

The existing Regulation 308 was originally developed in order to limit emissions to the environment on the basis of point of impingement effects after dispersion. Although Regulation 308 has been very successful in limiting the adverse effects of air pollution on the environment, a number of weaknesses, or problem areas have been identified in the regulation. These weaknesses include:

- failure to fully account for long range transport, long term deposition, bioaccumulation and persistence, very short-term and very long-term effects, and additive and synergistic effects;

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1 The Ontario Ministry of the Environment. June, 1986.

2 The Ontario Ministry of the Environment. "Clean Air Program Discussion Paper". November, 1987, p. ii.

3 Ministry of the Environment. "Economic Information Needs and Assessments for Developing MISA Monitoring and Abatement Requirements". March, 1987.

- o the lack of specific requirements for the treatment of emissions prior to discharge through stacks;
- o the use of outdated air quality models which are applied beyond their limits;
- o confusion in the use of models for fugitive sources and lack of specific rules for dealing with multiple sources;
- o lack of opportunity for public participation in the determination of standards and in the Certificate of Approval process; and
- o weaknesses in dealing with changes in land use.[4]

As the abatement and monitoring costs for industry to comply with these regulations were estimated by the Ministry and industry representatives, it became apparent that the cumulative economic impact of these two regulations on companies operating in Ontario might be significant. A fair proportion of plants in Ontario would be affected by the standards of both proposed regulations.

Representatives from the industrial sectors which would be affected by MISA and/or the revised Regulation 308 have voiced concerns with the Ministry's proposals. The main concern of the private sector involves the impact of these regulatory proposals on the competitiveness of companies operating in Ontario.

The business representatives fear that the regulatory proposals being made by the Ontario Ministry of Environment are far more strict than pollution controls in the U.S., other countries worldwide and even in the rest of Canada. If this is indeed the case, it is argued by the business representatives that resulting compliance costs may impose an undue economic burden on companies operating in Ontario, as they will face costs which their competitors in other Provinces and countries will not incur. This competitive disadvantage would force them to lose market share, close down their businesses and relocate elsewhere, or forestall their business expansion plans. A significant proportion of all companies operating in Ontario are foreign-owned, or are multinational with operations in several locations. If the standards being proposed in Ontario are indeed more strict and costly than elsewhere, then this will certainly be a factor in a company's decision in where to place its investments. Several companies and sector associations have suggested that they may take such a line of action if the proposals are put into place.

This is indeed a serious concern that warrants closer investigation. While industry representatives are generally supportive of the need for greater environmental protection, they fear that the policy initiatives of the Ministry will hamper economic growth and development in Ontario and not contribute to the greater harmonization of the heretofore conflicting goals of economic growth and a clean environment.

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[4] Ministry of the Environment. "Clean Air Program Discussion Paper". November, 1987.

To date, the discussions between the Ministry and the concerned business representatives have revealed a great deal of uncertainty about the true state of environmental regulation in the United States and of Canada's other main trading partners, and about the impacts on industries of these regulations.

1.2 PURPOSE

The purpose of this study was to determine whether or not Ontario's proposed regulations of its industries' toxic effluents and emissions constitute a competitive disadvantage for industries in the Province. Will these regulations, in particular MISA and the proposed amendments to Regulation #308, force Ontario's industries to lose market share, move elsewhere, or cancel expansion plans for their Ontario operations?

2.0 TECHNICAL POINTS ON FOCUS OF THE STUDY

A number of important decisions were made by the study team to focus the work. We identify them below, along with a brief description.

(i) substances regulated

This study is concerned with the regulation of hazardous and/or toxic chemicals and substances, referred to as "toxics". We did not examine regulations affecting the so-called "conventional" pollutants, typically taken to be pH, suspended solids and biological oxygen demand (BOD).

(ii) *jurisdictions of interest for the comparison*

The major effort in the comparison was to be between Ontario and selected Canadian Provinces, and between Ontario and selected U.S. States. The jurisdictions selected were as follows.

Canadian Provinces:

Alberta
Quebec

U.S. States:

Massachusetts
New York
California
Texas
Louisiana
Michigan
Tennessee
Georgia
New Jersey
Maine
Colorado
Illinois
with the U.S. Federal government counting as another jurisdiction.

The criteria used in selecting these States were that they should contain the nine major industries of interest to the study, should also represent different approaches to pollution regulation, and deal with enough States to give a good picture of the U.S. scene.

A second, more general comparison was to be made between Ontario and selected OECD countries. The following six countries were selected.

England
France

West Germany
Netherlands
Japan
with the European Economic Community being considered also.

These countries were selected, as in the case of the U.S. States, because of their industrial bases which compete with Ontario firms.

Priority was assigned to the comparisons between Ontario and the U.S. States and other Canadian Provinces. In comparing Ontario to the OECD jurisdictions, we worked from written sources only and did no original research.

(iii) sectors of interest

The research was focussed on the nine industrial sectors which would probably be affected by both MISA and the amendments to Regulation 308, i.e.,

- petroleum refining;
- pulp, paper and paperboard mills;
- organic chemical manufacturing;
- inorganic chemical manufacturing;
- iron and steel;
- metal casting;
- electric power generation;
- industrial minerals; and
- metal refining and mining.

These sectors were selected on the basis of Ministry-sponsored economic impact studies which identified them as possibly facing some impacts as a result of toxics regulations.

(iv) comparing approaches to regulation

The initial intent in the project was to develop a ranking scheme which would let us rank order each of the selected jurisdictions according to the impact of its regulations on the nine industry sectors. It became apparent, however, that this was not feasible. There were so many dimensions along which the jurisdictions had to be compared, and the jurisdictions were considering so many changes to their regulations, that it was not possible to develop a realistic approach for combining all of these perspectives into a single measure.

The approach finally adopted was to develop a set of comparison criteria and to compare Ontario, pair-wise, with each of the other sets of selected jurisdictions. That is, Ontario is compared against the other Canadian Provinces, and then compared against the selected States and the OECD countries.

The comparison criteria and the approach used are described in more detail later in this Volume of the report.

3.0 FORMAT OF THIS REPORT

This report is presented in three volumes, as follows:

Volume I: SUMMARY OF FINDINGS AND CONCLUSIONS

Volume II: DETAILS OF REGULATIONS AND ECONOMIC IMPACTS

Volume III: APPENDICES

Volume I is intended to be a stand-alone summary of the purpose of the project, how the study was carried out and the findings and conclusions reached as a result of the research.

Volume II presents the details of the analysis carried out on the various jurisdictions of interest to the Ministry clients. The reader will find in Volume II all of the detailed work that goes into the findings and conclusions of Volume I.

Volume III contains the appendices referred to in Volume II. These appendices consist of print-outs of databases prepared on effluent standards, results of enforcement practices, lists of individuals contacted during the study and a bibliography of materials uncovered during the course of the research. Appendix A has been bound separately because of its large size.

Cross-references are provided in Volume I to the materials of Volumes II and III so that the interested reader can identify the appropriate parts of the detailed reports that contributed to the findings and conclusions.

PART II

A COMPARISON OF REGULATIONS AND ECONOMIC IMPACTS

In this part of the report, we present the results of the comparison of Ontario with the other selected jurisdictions. A summary of the results of this comparison is contained in Tables I, II and III presented in the Executive Summary.

4.0 COMPARISON CRITERIA

Three sets of criteria were used to carry out the comparison of Ontario with the other selected jurisdictions: the extent of regulation, the enforcement of the regulations and the economic impacts of the regulations. Each of these sets of criteria is listed and described briefly below.

A. EXTENT OF REGULATION

These criteria assess the coverage of the regulations for the affected sectors, and thus present a picture of the overall regulatory burden imposed by the jurisdiction on hazardous and toxics substances. Four sets of criteria were used:

1. chemicals/substances regulated
   - o the specific effluents/emissions regulated and the levels to which their emissions are regulated;
   - o basis for determining whether a substance will be regulated;
   - o the technology requirements of the regulations; and
   - o the addition of other tests to the effluents, e.g., whole-effluent toxicity testing.

2. the scope of regulation, in particular by:
   - o point source emissions;
   - o overall air/water shed ambient measurements; and/or
   - o proposed use of the receiving medium (for watershed only).

3. clarity and consistency of the regulations
   - o number of jurisdictions involved in regulating and the degree of co-operation and consistency among them.

4. monitoring required
   - o number of substances, frequency and type of monitoring.

Quantitative measures were used for these criteria, whenever possible. However, as will be seen in the remainder of this report, it was not always possible to do so.

B. ENFORCEMENT OF THE REGULATIONS

The regulation of toxics is a burden to industry only if the regulations are enforced. Three criteria were used in an effort to assess the impact on industries of the enforcement approaches of the various jurisdictions:

1. legal enforcement mandate vs. actual approach;
2. severity of actual penalties imposed and probability of being caught; and
3. likely changes in current approaches.

C. ECONOMIC IMPACTS OF THE REGULATIONS ON THE AFFECTED INDUSTRIES

The economic impacts on the affected industries of the toxics' regulations is a key aspect of the comparison. Three criteria were used to unearth the net cost to industry of the regulation of toxic substances:

1. effects of the regulations on industry costs;
2. market effects of any cost increases; and
3. assistance programs available to industry to offset any cost increases.

5.0 ONTARIO VS. QUEBEC AND ALBERTA

All three jurisdictions are in the midst of major overhauls of their regulation of toxic industrial effluents and emissions.

- Ontario is implementing its MISA program to regulate industrial discharges to water, and has proposed significant amendments to its air pollution control mechanism, i.e. Regulation 308.

- Quebec has just recently announced its *Industrial Waste Reduction Program*, designed "...to quickly eliminate the major pollutant loads discharged into the water, air and soil by big industry...".

- Alberta has published in early 1988 *An Action Plan for Environmental Law Enforcement in Alberta*. This action plan will result in the establishment of new emission and ambient standards, tougher permitting procedures and more stringent and automatic enforcement processes.

Each of these regulatory initiatives is a major undertaking, with many of its features and details left to be worked out by task forces. Comparing three embryonic initiatives is thus a difficult task. However, there are enough similarities among the approaches being taken to make the comparison meaningful.

The role of the Federal Government in the regulation of industry's toxic chemicals and substances is also changing rapidly with the passage and implementation of the Canadian Environmental Protection Act (CEPA). We discuss this point in more detail below.

The detailed analyses of the environmental regulations in these three Provinces and the Canadian Federal Government are contained in Volume II, Part I.

5.1 THE EXTENT OF REGULATION

sectors regulated

The priority objective of Ontario's MISA program is to reduce the discharges of about 300 industrial plants and mines identified as the major direct industrial dischargers, and the 400 municipal sewage treatment plants in the Province. (Vol. II: I:2-1)

The priority industry sectors covered by MISA are the following:

- organic chemical manufacturing;
- inorganic chemicals;
- petroleum refining;
- pulp and paper;
- metal castings;

- o industrial minerals and manufacturing;
- o electric power generation;
- o metal mining and refining; and
- o iron and steel.

Quebec's new Industrial Waste Reduction Program (IWRP) has taken an approach similar to MISA. There are six priority industrial sectors in IWRP:

- o pulp and paper;
- o mines;
- o metallurgy;
- o chemical;
- o oil; and
- o surface coverings.

Thus, the Quebec program has targeted many of the same industries as has MISA.

Alberta has not yet targeted specific industries. It is our opinion that specific industries will be targeted once the priority pollutant list, now being developed, is completed. Alberta already has waste water effluent guidelines for petroleum industries, and we understand that more industry-specific guidelines will be developed.

specific substances

Of the three jurisdictions, Ontario is the furthest along in identifying the specific chemicals and substances which might be subject to regulation. MISA lists 179 priority pollutants, and the draft revisions to Reg. 308 identifies 100 chemicals and substances which might be regulated. (Vol. II: I:2)

The Federal Government is also a player here. A preliminary list has been published of 55 chemicals and substances which might be regulated under CEPA. Any regulations passed under CEPA would apply across the country, unless a Province could demonstrate that its own regulations were the equivalent to, or more stringent than, CEPA's. (Vol. II: I:1)

Quebec is developing a similar list of chemicals and substances, but the work is not yet completed. We understand that Quebec officials are using both the MISA background studies that led to the MISA priority pollutant list, and the U.S. EPA list of priority pollutants that in turn contributed to the MISA work.

In fact, the Discussion Paper states that Quebec's approach to the regulation of specific substances "will be inspired by those existing elsewhere in Canada or in the United States".[1] Environnement Quebec officials have stated that they used MISA as a model in developing their waste reduction program.

Alberta has developed a process for establishing priority pollutants and the process is awaiting approval. An Alberta Environment official stated that the process used will take into consideration work done by the Canadian Federal Government, U.S. E.P.A., Ontario Ministry of the Environment and the State of Michigan.

basis for determining whether to regulate

The Ontario programs use risk assessment to determine whether or not chemicals and substances will be regulated. Four factors go into the assessment:

- o toxicity;
- o persistence;
- o bioaccumulation; and
- o mobility in the environment.

The Quebec IWRP will establish regulatory waste control standards "according to the sensitivity of the host environment and to the acceptable hazards to human health."[2]

Alberta has not announced how it will determine what to regulate, but initial indications are that the process will use some type of risk assessment. In fact one of the recommendations of the review panel was that monitoring requirements consider the potential of a contaminant to affect the environment. License requirements may also be based on risk assessment under the Action Plan, and Alberta is considering the development of effluent standards for watersheds based on intended use of the water.

technology basis of the regulations

This point has not yet been decided for Ontario's proposed revisions to Reg. 308. In general, the Ontario position is that limits will be based upon the optimum performance that could be achieved by various levels of abatement technologies.

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1 Ministere de L'Environnement du Quebec. Discussion Paper - Industrial Waste Reduction Program. June, 1988.

2 Ibid.

For water discharges, the premise of the MISA program is that existing technology can achieve the "virtual elimination" of the identified priority pollutants. The MISA standards and limits to be developed will be based on the "best available control technology economically achievable" (BACTEA). The methods for determining the limits and selecting the technologies to be considered as representing BACTEA have not yet been determined.

The waste standards that must be met by industries in Quebec will be revised so that they reflect the current abilities of waste reduction technologies. These new standards for conventional pollutants will reflect the Best Conventional Pollutant Control Technology (BCT equivalent). The standards for toxic pollutants will be determined based on the Best Available Technology Economically Available (BAT-EA). The BAT-EA technologies will be the treatment technologies normally involving waste reduction through process change (clean technologies). The approach of the Quebec government is similar to that of Ontario, however, one noticeable difference is the Quebec government's emphasis on the adoption of clean technologies.

Alberta's initiatives in this area have not outlined a technology basis for new regulations. This possibility should not be ruled out however. Alberta's Waste Water Effluent Guidelines for Alberta Petroleum Industries present guidelines based on the use of Best Practicable Technology (BPT), and the action plan recommends that license requirements be based on available technology as one criterion.

other types of tests

Ontario, Quebec and Alberta are proposing to require the use of pollutant analysis and waste stream characterization for water discharges to determine effluent composition (Alberta already uses some waste stream characterization).

consistency of the regulations

Industries in Canada can be subjected to both Federal and Provincial environmental regulations. The major piece of Federal legislation is C.E.P.A., and most of the Provinces have an environmental protection/quality act.

As substances on the C.E.P.A. Priority Substances List (Table 1.2 in Volume II) are studied, added to Schedule 1 of CEPA - the List of Toxic Substances (Table 1.1 in Volume II) and regulated, a minimum level of regulation of toxic substances will develop in Canada. The equivalency provision of C.E.P.A. is designed to prevent the double regulation of a chemical within a Province. Where Provincial regulations are equivalent[3] to C.E.P.A. in terms of emission limits, and enforcement (i.e., the level of regulation) then the Federal Environment Minister may declare the Provincial regulation to be equivalent to C.E.P.A., and the Provincial regulation will apply within that Province.

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[3] Note "equivalent" in this definition means at least as stringent and, therefore, a Provincial regulation can be more stringent and still be equivalent.

C.E.P.A. will eventually lead to a minimum level of toxics regulations nation-wide, in that all Provinces will have to regulate to at least the CEPA-specified level. There still may be differences in the level of regulation between Provinces where a Province has controls that are more stringent than C.E.P.A. or where a Province controls a substance that is not controlled by C.E.P.A.. This inconsistency of regulation may occur in the short term but will probably decrease in the long term. The Provinces, especially Ontario and Quebec but also Alberta and British Columbia (and possibly others that were not looked at by this study) are co-operating and sharing information. This process has resulted in similar regulations being developed in the different jurisdictions. MISA and Reg. 308 are very similar to the IWRP initiative in Quebec, and both Alberta and B.C. have looked at Ontario's enforcement program. We expect this trend of information sharing to continue, and it will contribute to the development of similar programs.

monitoring and permitting

MISA now calls for extensive monitoring by the affected sectors as a precursor to the determination of effluent standards. The monitoring requirements that will continue after this first phase have not yet been determined.

The proposed changes to Reg. 308 call for extensive monitoring by regulated industries. The Quebec approach is similar.

Quebec has point source emission standards for many of the chemicals that are covered under Ontario's existing Reg. 308. The regulation covers existing and new plants and contains monitoring and reporting requirements. Under IWRP, all industries will be required to obtain Waste Management Certificates. These certificates will be valid for 5 years and will contain information on the types and quantities of waste produced, allowable limits, monitoring requirements and requirements for any other studies that must be conducted by the firm. Applications for a certificate must include the results of a waste stream analysis.

Alberta currently has the most stringent monitoring regulations, and the Action Plan is calling for an enhancement of them.

Alberta has in place extensive licensing requirements. Current requirements under the Clean Water Act and the Clean Air Act call for waste stream characterizations to be completed and the results must accompany applications for licenses. Alberta has very stringent ambient air standards. The Action Plan calls for a repeal of the ambient air standard regulations and the establishment "of a comprehensive set of objectives for a number of contaminants". The new initiative will include source monitoring.

The new license requirements under the plan include carrying out a risk assessment study for emergency events. The new licenses will have "maximum emissions limits based on risk to human health, life, property or the environment" and "performance limits based on past performance in the industry, available technology and established standards for the industry." Licenses will continue to require monitoring. The monitoring requirements will change to reflect the properties of contaminants.

5.2 ENFORCEMENT

Ontario has 100 staff including 54 investigators involved in enforcement. Both British Columbia and Quebec are using Ontario's system as a model. Ontario has increased its enforcement efforts since the inception of the Investigations and Enforcement Branch in 1985. Both the number of cases and the average fine levied have increased. Bill 112 increased the maximum fines to $250,000 per day for first offences and $500,000 per day for repeat offences. The Bill also added the provision for jail terms. The Ministry plans to begin publishing reports on offences shortly.

Enforcement of environmental laws is a new initiative of the Government of Quebec. The government recently established investigations and inspections groups. The goal is to achieve a level of enforcement that is at least as high as Ontario's. Bill 99 gives the Ministry's enforcement officials broad powers of enforcement including search and seizure as in the case of Ontario. The Bill also has a provision for jail terms and fines of up to $250,000 for first offences and $500,000 for repeat offences. Much of Quebec's program is based on the "polluter must pay" principle, and the government is making industry responsible for environmental quality.

Alberta conducted a comprehensive study of its enforcement activities that resulted in An Action Plan for Environmental Law Enforcement in Alberta. In preparing the Plan, the Review Panel heard submissions from government, industry, public interest groups and research institutions. Government representations from:

- B.C. Ministry of the Environment
- Environment Canada
- Alberta Environment, and
- Ontario Ministry of the Environment

gave submissions.

Alberta Environment will be using control orders, stop orders and tickets to enforce its legislation. A new order to allow the Ministry to suspend operations was also recommended. Failure to comply with any of these Ministry Orders can result in prosecution. The use of these orders and the rate of issuing of tickets has increased. The Pollution Control Division is responsible for enforcement and is in the process of developing a database that will be used to formulate compliance reports.

The Enforcement and Compliance Branch of Environment Canada has approximately 60 inspectors involved in each of three regions. The Department used to negotiate compliance and supply expertise, but recently there has been a move towards stricter enforcement of legislation. C.E.P.A. will be enforced using regular inspections as well as spot checks. Violators will be charged and in most cases prosecuted. Department officials have been given broad powers of search and seizure under the Act. The Department is working with their Provincial counterparts to reduce the duplication of effort and prevent double jeopardy.

5.3 ECONOMIC IMPACTS

effects of the regulations on costs and markets

The only one of the three jurisdictions studied which has any real information about the possible costs, benefits and market effects of its proposed toxics regulations, is Ontario. At that, Ontario has cost estimates only for its proposed regulation of air toxics. The cost impacts of its water toxics abatement program have been made only for the initial phase of monitoring of effluents. The subsequent costs of implementing the eventual new control measures have not yet been prepared.

Quebec has apparently done some preliminary work on the likely costs of its regulations, but has not released the information. One insight into the likely approach in Quebec to dealing with the costs of its toxics control measures is the statement in its announcements that:

> "The industrial waste reduction program is designed to quickly eliminate the major pollutant loads discharged into the water, air and soil by big industry,... the government considers that the responsibility for industrial cleanup rests primarily with the polluting industries."

Thus, the regulated industries will pay the bulk of the costs of compliance.

Alberta has not carried out any such studies to date. The only studies carried out by the Federal government are of limited scope from the perspective of this project.

At the time of writing this report, seven of the Ontario Ministry's cost-estimating studies were available in final or final draft form. The following cost ranges (in millions of 1988 dollars) were estimated for the pre-registration monitoring stage only:

- Iron and steel: $0.03 - $2.8 per plant.
- Pulp and paper: $0.18 - $1.5 per plant.
- Organic chemicals: $0.1 - $2.5 per plant.
- Inorganic chemicals: $0.04 - $0.59 per plant.
- Metal casting: $0.008 - $0.5 per plant.
- Mining: $0.2 - $0.4 per plant.
- Petroleum refining: $0.43 - $0.62 per plant.

These costs represent the total capital and one-year operating costs for the monitoring phases.

In all cases, the costs were judged by the Ministry analysts to be "financially manageable", "small in relation to aggregate industry financial indicators", or "not significant".

The Ontario Government's study of the likely cost implications of its proposed air pollution regulations[4] produced results that varied widely by sector and according to the regulatory scenario being considered. (Vol. II: I:2-9) The likely market effects of incurring these costs also varied with the sector. Some of these sectors were competing successfully in the United States, and were concerned that any degradation in their competitiveness would jeopardize their successes there. For the sectors of interest to this project, the following is a brief summary of the results.

pulp and paper:	For the three sub-sectors examined, compliance costs were estimated to be about 1%-2% of reported profits. While these costs were not considered to be significant, it was also noted that the industry is intensely competitive and is in need of considerable capital investment.
petroleum refineries:	Implementation costs for this sector were up to 8.7% of the industry's profits, a significant sum that would pose serious problems for the industry.
organic chemicals:	There is such a variety of products and processes in the organic chemicals industry that it was difficult to draw any conclusions about the impact of compliance costs on the profitability of the sector. Annual compliance costs appear to represent between 0.05% and 1.1% of total 1987 revenues for a sample of companies for which financial information was obtained, but no clear picture emerges as to how well firms will cope with these costs.
other chemical products:	The 188 companies that make up this Ontario sector vary tremendously in most respects, and they produce a wide variety of products. As with organic chemicals, it was impossible to draw any conclusions about the financial difficulties that might be experienced by this industry as a whole.
foundries:	Most of the 61 Ontario iron foundries considered in this study are small. This sector is characterized by low profit margins and strong competition, although there are exceptions. Any additional costs not borne by competitors in the rest of Canada and the U.S. can be expected to have serious consequences on Ontario-based companies. For example, compliance costs for ferrous foundries are estimated to be the equivalent of 26% of recent representative profit levels.

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[4] Ontario Ministry of the Environment. "Economic Assessment of Proposed Revisions to Regulation 308". October, 1988.

ferro-alloy industry: There is only one ferro-alloy company in Ontario. The estimated compliance costs are less than 0.5% of the current selling price of the final product. While this cost is not negligible, it is likely that the future of this 16-employee firm will be determined by market events over the near term, particularly the security of supply of raw materials.

The overall conclusion of that study was that some sectors would be affected seriously, both at the cost and market level; others would see their costs go up but would probably be able to pass on the increases to their consumers; and still others would not be affected to any significant degree.

Of course, these cost estimates were for complying with the proposed air toxics regulations only. MISA will eventually produce regulations for water toxics which will probably increase the total costs of compliance with environmental regulation.

Presumably those sectors that would be affected by the proposed Reg. 308 changes would be even more seriously affected by both regulatory changes, while some sectors largely unaffected by Reg. 308 might face costs as a result of the eventual MISA regulations.

As noted above, there are no comparable estimates of costs and economic impacts of the toxics controls regulations in the other Canadian jurisdictions. Thus, it is not possible to draw an overall conclusion about the relative compliance costs to Ontario-based industries as opposed to industries located in Quebec and Alberta.

assistance programs available to industry

None of the three Provinces offers assistance programs to assist industries to comply with toxics regulations. The closest to a support program is the rebate by both Ontario and Quebec of the Provincial sales tax for pollution abatement equipment purchased by industries. All three Provinces have general support programs that industries could use to defray portions of the costs (especially any related R&D costs) of complying with the regulations. These programs are not aimed at pollution abatement specifically. Details of these programs are provided in Volume II. The levels and types of support provided do not offer significant competitive advantages to firms in any of these three Provinces.

Quebec's new initiative, Production without Pollution, is encouraging the use of clean technologies and will be lending scientific and engineering experts to industries in the Province. This may offer some technological advantage to Quebec-based firms, depending on the level of funding and expertise that backs up the announcement.

The most significant support program available to Canadian firms to help meet pollution abatement requirements is one that is accessible equally to firms in all three Provinces, i.e. the accelerated capital cost allowance granted under the Federal Income Tax Act. No inter-Provincial competitive advantage is afforded by this allowance as all firms can make use of it. However, this initiative does give Canadian-based firms a competitive advantage over their U.S.-based competitors

complying with similar regulations. The U.S. grants no such favourable treatment to pollution abatement capital expenditures.

The overall conclusion is that there are no significant competitive advantages bestowed by Provincial support programs.

5.4 CONCLUSIONS

On the basis of this comparison, we reach the following conclusions.

- There are no competitive advantages granted by Provincial support programs, and all industries in Canada benefit equally from the accelerated capital cost allowance feature.

- All three jurisdictions have a variety of regulations and licensing processes that impose pollutant controls at specific plants. The emphasis to date has been on the so-called "conventional" pollutants such as pH, suspended solids, and biological oxygen demand (BOD).

- Ontario's current regulations result in inconsistent treatment of pollutants, including toxics, among plants in the same sector and across sectors. Quebec's regulations are similar. Alberta's current approach to permitting, monitoring and reporting is more stringent than that of either Ontario or Quebec.

- All the Provinces are in the midst of major overhauls of their regulation of air and water toxics. Ontario is much further advanced than the other two Provinces in identifying the specific toxics likely to be regulated and in setting preliminary schedules for regulations.

- Ontario's MISA program has identified 179 parameters, including toxic chemicals, likely to be regulated across the nine priority industry sectors. The proposed amendments to Regulation #308 identify 100 toxic substances that might be regulated.

- Neither Quebec nor Alberta is yet at this advanced stage. However, Quebec has announced publicly a major commitment to environmental protection through its new "Industrial Waste Reduction Program". This program focuses on many of the same sectors that would be regulated under MISA and Regulation #308. While details are still being worked out in government-industry committees, we understand that the Quebec program is being based on both Ontario's approach and the approaches of other jurisdictions that figured in the design of the Ontario model. The Quebec approach will be a technology-based one, as in Ontario, but with greater emphasis on the introduction of clean technologies. In our view, if the Quebec government maintains its current momentum it is conceivable that Quebec will introduce controls of toxic pollutants in the same time horizon being considered for MISA and Regulation #308. Quebec's stated target date for introducing toxics regulations is 1992. The specific toxics to be regulated have not yet been identified.

- Alberta is at an earlier stage, and is just developing a process for identifying priority pollutants.

- Ontario's enforcement approach is believed to be much more stringent than that of Quebec. Quebec's new enforcement approach is being modeled, in part, on that of Ontario.

- Quebec is moving towards a "one-stop shopping" approach in its pollution regulation. All regulations and all media will be covered by the "depollution attestation" certificate which will be required. This may simplify the task of compliance on the part of firms.

6.0 ONTARIO VS. THE UNITED STATES

As has been pointed out in the analysis of Volume II, the U.S. experience in regulating water-borne toxic effluents has been quite different to that of regulating air-borne toxics, and so we deal with the two cases separately in the following analysis.

A summary of the results of this comparison is presented in Tables I, II and III in the Executive Summary.

The detailed analyses of the U.S. Federal and State environmental regulations is contained in Volume II, Part II.

6.1 WATER EFFLUENTS

Details of the U.S. regulation of water toxics are contained in Vol. II: II:5.

6.1.1 The Extent of Regulation

(i) chemicals/substances regulated

specific substances

The U.S. Federal Water Pollution Control Act, known as the Clean Water Act (CWA), sets objectives for all discharges into navigable waters of the United States and establishes standards for industries and municipalities. Federal regulations under this Act are promulgated and enforced by the U.S. Environmental Protection Agency (EPA) or by the States if they develop programs that are equivalent to the Federal one. Currently, 39 States administer equivalent programs.

The CWA combines technology-based and water quality-based approaches to pollution control. At a minimum, all dischargers must meet national technology-based controls which are based on the results achieved by actual industry practices in limiting the amount of pollutants in their effluent. Under the water quality-based approach, the States determine water quality needed for planned water uses such as fish and wildlife, drinking water, and recreations, and set effluent limits accordingly.

When technology-based treatment requirements are not sufficient to clean up a stream to the desired water quality level that allows for the designated use, the CWA requires the use of a water quality-based approach. Under this approach, the States identify such waters and designate them as "water quality limited". If so designated, the States are to establish more stringent pollution limits called "total maximum daily loads" (the greatest amount of a pollutant the water body can receive daily without violating a State's water quality standard), and to take whatever additional cleanup actions are necessary. Such actions might include requiring advanced levels of wastewater treatment or control over non-point source pollution. EPA is required to approve the maximum loads set by the States. If it disapproves, EPA must develop maximum loads for the States' water-quality-limited segments.

Special regulations exist for industrial facilities that discharge directly into waterways and for facilities that discharge "indirectly" to a publicly owned treatment works (POTW). The direct dischargers in Ontario are also the primary focus of the current MISA program. Under Section 402 of the CWA, all facilities, industrial and municipal, discharging directly into waterways are required to obtain a National Pollution Discharge Elimination System (NPDES) permit. Direct industrial discharges regulated under NPDES must comply with:

- o applicable federal industrial effluent limitations set forth in Sections 301 and 304 of the CWA; and/or
- o applicable State water quality standards following procedures set forth in Sections 302 and 303 of the CWA.

Industrial dischargers are issued NPDES permits with discharge limits and compliance schedules designed to meet federal industrial discharge technology based standards and to achieve State ambient water quality standards. Individual States, therefore, can have effluent standards more stringent that federal technology based limits, if the State standards are part of a State program to maintain ambient water quality for uses such as recreation, wildlife, and drinking water. Federal NPDES permits are issued either by the State government if the State has an EPA approved NPDES program or by a regional EPA office. Dischargers in States that do not have approved NPDES permits may need to obtain both State and federal permits.

In practice, the specific requirements of a NPDES permit are determined on a case-by-case basis. The State or EPA permit writer typically will first consult the federal technology-based standard. If such a standard does not exist, a State technology-based requirement may apply or "best professional judgement" may be used by the permit writer to establish discharge limits. The permit writer then consults the State water quality-based requirements for the receiving body of water. Limits based on water quality-based standards more stringent than technology-based standards may be added to the permit. The permit may also include detectability thresholds for certain chemicals and requirements for biological or "whole effluent" toxicity testing for overall insurance that the permit requirements are being met.

Issuance of NPDES permits now emphasizes the control of toxic pollutants, by integrating technology and water quality-based permit limitations, best management practices for toxic discharges, sludge requirements, and revisions to the pretreatment implementation requirements. These requirements affect all major permittees and those minor permittees whose discharges may contribute to impairment of the designated use for the receiving stream. The goal of permitting is to eliminate toxicity in receiving waters that results from industrial (and municipal) discharge.

Strategies to control toxic pollutants are relatively recent developments. Although, the 1972 CWA mandated that EPA establish toxic effluent standards based on health and environmental considerations, only six toxic effluent standards were developed before 1977. The 1977 amendments directed EPA to develop technology-based standards for toxic effluents for major industry groups (termed "categorical" industries).

In addition to technology based limits for toxics, EPA and the States are currently devising or updating water quality-based standards to emphasize toxic pollutants. The 1987 amendments to the CWA (The Water Quality Act of 1987) directs EPA and the States to identify waters that require controls for toxic pollutants. The 1987 amendments established deadlines for individual water quality-based control strategies (February 4, 1989) and for compliance with the toxic control permit requirements (February 4, 1992).

To date, there are only 126 chemicals listed on the EPA's list of priority pollutants, versus the list of 179 substances which could be regulated under MISA. However, most, if not all, of the most toxic substances are common to both lists. In fact, the EPA lists and those of the State of Michigan figured heavily in the development of the MISA list of priority pollutants. There are 18 chemicals and groups of products (e.g., some pesticides) that are on the EPA priority list but not on the MISA list.

We noted above that many States are augmenting the EPA effluent standards with their own water-quality based standards and/or whole-effluent toxicity tests. Four States (New York, New Jersey, California and Michigan) now have in place regulations that collectively are comparable to the full set of MISA chemicals. Thus, industries in these jurisdictions are already operating under regulations of these toxics.

The other States are generally catching up to New York and Michigan, but the process may take up to ten years for two main reasons:

- Though promulgation began in the late 1970s, some of the EPA's technology-based standards are just being implemented. The regulations for the organic chemicals sector, a major source of water-borne toxics, were promulgated only in 1988; and

- The set of suggested standards and tests for water-quality measurements, arising out of the 1987 amendments to the Clean Water Act, are just now being worked on, and are expected to be completed by the end of 1989. Enforcement is expected to begin in 1992. Observers of EPA expect some significant delays in this schedule.

basis for determining whether to regulate

The original basis for determining whether or not a substance would be regulated, i.e., placed on the EPA priority pollutants listed in the Clean Water Act of 1977, was risk assessment. The factors considered in the risk assessment were similar to those being used in Ontario. Two other questions are used by the States to determine the basis for regulation:

- is there a technology that can be used to control the release of the substances? and

- from a water quality point of view, will the substance impair the intended use of the receiving water body?

technology basis of the regulations

The EPA development documents base the effluent limits for the so-called "major categorical industries" by estimating the extent of pollutant removal accomplished through use of a particular level of control technology. BPT, BCT, BAT, and NSPS apply to direct discharges:

- For existing sources, best practicable technology (BPT) and best conventional technology (BCT) standards were designed for conventional pollutants. BPT limitations are based on the average of the best existing performance by plants of various sizes, ages, and unit processes within the category for control of conventional pollutants. In establishing BPT, EPA considers the total cost in relation to the effluent reduction benefits, the age of equipment and facilities involved, the process employed, and process-change and engineering aspects. The 1977 amendments to the CWA added BCT for the discharge of conventional pollutants. BCT can not be less stringent than BPT. BCT limitations are developed with a two-stage "cost reasonableness" test that is defined in the regulations. The first test compares industry treatment with POTW treatment costs; the second examines the cost-effectiveness of additional treatment beyond BPT.

- Best available control technology economically achievable (BAT) applies to toxic and non-conventional pollutants. BAT represents the best existing treatment performance in the category. EPA considers the same sort of factors listed for BPT in establishing BAT.

- New source performance standards (NSPS) were developed for new sources equivalent to BAT/BCT. NSPS represents the most stringent numerical values attainable through the application of the best demonstrated control technology for all pollutants (conventional, toxic, and nonconventional).

The standards do not require the use of "approved" technologies, but *de facto* an industry applying for a permit will choose a technology which was either the basis for the development of the standard or which will attain the discharge limits set by the regulation. Some of the standards are "production-based" limits to avoid the problem of industry diluting its toxic effluents prior to releasing them to the watershed.

other types of tests

States can, and do, add other types of tests to the EPA-based standards to insure that dischargers meet State water quality-based standards. About 50% of the States examined are moving to the addition of whole-effluent toxicity testing to the substance-specific regulations of the effluents.

(ii) scope of the regulations

All point source emissions for the industries considered are now regulated, with the exception of the organic chemical sector for which compliance with EPA regulations

starts this year. This constitutes a baseline of regulation that is common across all of the States. Some States have gone beyond this baseline and impose additional regulations.

Regulations linked to water uses are largely complete in many of the States, based on the designated uses set by the States. Ambient standards are now being developed for toxics by the States and EPA. This process will probably continue for a decade as new toxics are discovered and regulated and as the methods of detection and the impacts of toxics on water uses are better defined. Thus, industries in the States are currently, or will soon be, operating under the burden of both technology-based and water quality-based regulations for toxic wastewaters.

(iii) consistency of the regulations

The EPA has an equivalency clause similar to that in Canada's new C.E.P.A. that authorizes States to issue the relevant EPA permits to direct dischargers, if the State has a program equivalent to the EPA's. Four of the twelve States which we examined are not yet designated to do so, but are actively working towards achieving this rating. In these non-designated States, an individual plant could require two permits at least (one from each of the EPA and the State). Our research did not permit us to determine whether or not this is a burden to the affected industrial plants.

(iv) monitoring required

Self-monitoring and reporting is the rule for both the EPA and State regulations. Quarterly reporting by industries is backed up by spot checks carried out by both EPA and State officials. Violations of the regulations usually call for special, immediate reporting by the industry. The EPA can then order the plant to shut down or can assess fines against the polluter.

6.1.2 Enforcement

Compliance with environmental legislation in the U.S. has typically occurred over a ten- to fifteen-year period which includes passage of the legislation, promulgation of regulations, compliance deadlines, actual compliance by most affected parties, and enforcement and litigation activities. Promulgation of regulations by EPA, revisions of compliance deadlines, allocation of sufficient federal and State budgetary support for program implementation, government enforcement activities, litigation, and compliance delays by business and government have typically extended the implementation period for more than ten years following enactment of the legislation.

Technology-based and water quality-based toxics standards have only recently begun to be formulated, implemented, and enforced. Programs and activities are being undertaken now by EPA and the States to insure that substantial compliance with

water toxics regulations by industrial facilities (and others) during the next five to ten years:

- o compliance deadlines for toxic effluents are just being reached for most categorical industries;
- o regulations for the organic chemicals sector were only promulgated in 1988;
- o EPA guidance documents, monitoring procedures, testing methods, and enforcement strategies have or are being revised to include and to highlight toxics;
- o State programs for water quality-based toxics control strategies were to be completed by February 4, 1989 (many States will miss the deadline but expect to have their programs ready in 1989) and compliance with the toxic control water quality-based permit requirements is scheduled for February 4, 1992 (mandated by 1987 amendments to CWA); and
- o EPA can now take administrative actions in many civil cases avoiding lengthy referrals to the U.S. Department of Justice and Justice court actions (1987 amendments to CWA).

Lack of staff and budgetary support have hampered EPA and State permitting and enforcement activities. Whether or not Congress and the President will rectify this situation remains uncertain. Reviews of EPA and States CWA activities by the U.S. General Accounting Office (GAO) and the U.S. Congress Office of Technology Assessment (OTA) generally indicate that progress is being made but that it is too slow and does not meet legislative deadlines, that regulations allow for substantial loopholes in compliance, and that staff and budgetary resources are inadequate to implement the programs. In addition, environmental groups such as the Natural Resources Defense Council have brought citizen suits against major dischargers to force more rapid compliance with effluent regulations.

The disparity of EPA data and data tracking programs and the dearth of studies that analyze what the enforcement data means, limit our analysis of the effectiveness of the CWA enforcement programs.

Almost all jurisdictions report that their approach to date has been to encourage and negotiate compliance, rather than to pursue an adversarial stance.

The current public stance of all jurisdictions is that "We're going to be very tough and go after the toxics offenders". The public is seen as demanding this new approach. An examination of the EPA records on enforcement cases shows an increase of about 300% in the number of enforcement cases being handled in the late 1980's as compared to the early part of the decade. However, we did not discern any general translation of this stance into increased resource allocations or strengthened mandates.

6.1.3 Economic Impacts

The overall cost to U.S. industry of complying with the regulation of toxic and conventional pollutants in wastewater effluents over the period 1979 to 1986 has been estimated to be between 0.3% and 2.4% of sales, depending upon the sector affected. It is not possible to separate out the costs of complying with just the toxics regulations.

In most cases these total compliance costs, in our view, are negligible. An exception is the organic chemicals sector. Costs to this sector are estimated to go up to about 8% of total capital investments over the next ten years.

The regulators have been concerned about the possible differential impacts of regulations on small businesses, and some of the regulations have offered exemptions to this sector to reduce the financial impacts.

Almost all of the regulated sectors forecast serious economic consequences as a result of the regulations. We have not identified any industry-sponsored *ex post* studies of economic effects of regulations that either dispute the above estimates of costs, or demonstrate significant economic disruptions as a result of the regulation of toxic pollutants. In our judgement, this can be taken as a sign that industries successfully absorbed the costs of complying with these regulations.

The level of government support provided to U.S. industry to comply with water pollution regulations is small. There are many government assistance programs (both Federal and State) to industry, but most of the relevant programs are targeted at small businesses.

There are no significant U.S. State or Federal tax incentives for capital investments in pollution abatement and control. The tax reform changes passed in 1986 made two major changes that affect capital expenditures:

- the 15% investment tax credit was eliminated; and
- the 3-10 year depreciation periods were extended to up to 50 years.

One State-level incentive that has been used to finance private pollution control facilities has been the issuance of Industrial Development Bonds (IDBs). These bonds are tax-exempt and thus permit the corporations to borrow money at a slightly lower rate of interest than in the taxable debt market. The 1986 Tax Reform Act capped this incentive at $50 per capita per State, annually.

6.1.4 Conclusions

The toxic chemicals and substances regulated, and the extent to which they are regulated, vary somewhat among the States and between Ontario and the individual States. However, all jurisdictions are operating from similar definitions of toxic substances and the lists of substances being regulated are similar. Further, all jurisdictions also impose, or are planning to impose, whole-effluent toxicity tests and/or water quality-based standards on the effluents of industries.

costs to U.S. industries of complying with toxic and conventional pollutants regulations suggests further that any such competitive advantage would be small.

- The Canadian accelerated capital cost allowance for pollution abatement and control equipment offers a major competitive advantage to Ontario-based firms over their U.S.-based competitors. After-tax costs of compliance in Ontario will be much less than comparable costs in the U.S.

6.2 AIR EMISSIONS

For the detailed analysis of U.S. air toxics regulations, see Vol. II: II:6.

6.2.1 The Extent of Regulation

(i) chemicals/substances regulated

Ontario's proposed Regulation 308 is much more stringent than current air toxic controls in the United States. One hundred substances are proposed for regulation under Reg. 308. However, as discussed below, because of evolving State programs and the strong likelihood of new federal legislation, this may not remain the case for very long.

List of Pollutants

The U.S. federal regulation of air toxics under Section 112 of the U.S. Clean Air Act has resulted in control of only seven substances. This obviously falls far short of the 100 pollutants under Regulation 308. Few experts believe that EPA's performance will significantly improve under the current structure of Section 112.

To fill the void created by EPA, many States have moved to control air toxics. Unlike many environmental control programs in the United States, State control of air toxics is not done under the ambit, or with the guidance, of the federal government. Each State is proceeding independently without any particular model. As a result, there is considerable variability in the programs, making it difficult to draw any concrete comparisons with Regulation 308. In addition, most of these programs are in the formative stages of development and implementation, and many are being implemented informally without benefit of regulations. This increases the discretion in State regulators and makes less certain the air toxics controls that may be required in individual cases.

Some comparisons can be made. A number of States address a wide variety of substances when they consider permits. California, Colorado, Georgia, Louisiana, New Jersey, Texas and Massachusetts evaluate the need for controls on specific lists of pollutants. However, these lists are neither inclusive nor exclusive. The fact that a pollutant is on a list in these States does not mean that it is required to be limited by the permit that is issued. Similarly, pollutants not on a list can be controlled in appropriate circumstances. States that do have lists are in the process of expanding them. The coverage is quite comprehensive in some States. New York has established acceptable ambient air quality levels for over 250 air

Many sectors in the U.S. have been operating under these regulations of toxics for 10 years now. Ontario firms are still in the preliminary phase of monitoring their effluents to determine which of the pollutants are present and should be abated.

Enforcement policies and practices are difficult to compare, since all jurisdictions have traditionally used a negotiated approach rather than a litigious one. However, the current public stance of all of these jurisdictions is similar in that all call for more stringent enforcement of toxics regulations.

A summary of the economic impacts on firms of both BPT and BAT-EA technology controls is presented in Table 3 at the Executive Summary, with the detailed analysis contained in Vol. II: II:5-7. The total BPT and BAT-EA costs for the sectors of interest are as follows:

Sector	Costs (in millions of 1985 U.S. dollars)
Iron and steel	$75.3
Pulp and paper	$2.91
Organic chemicals	$297.8
Inorganic chemicals	$24.5
Mining	no cost impacts
Petroleum refining	no cost impacts
Electric power generation	no cost impacts

The costs of both BPT and BAT-EA must be considered because in some sectors BPT has the side-benefit of removing some toxics. The BAT-EA cost is then the incremental cost of removing the remaining toxics.

The costs of complying with MISA regulations have not been estimated, since the effluent limits are still being developed. However, to date the costs to U.S. firms for complying with toxic pollutants have been negligible, with the possible exception of the organic chemicals sector. Firms operating in Ontario receive a significant Federal tax break for their investments in pollution abatement and control via the accelerated capital cost allowance. There is no comparable break for U.S. companies.

The overall conclusions are as follows.

- There are differences between Ontario and the States examined in the toxic pollutants regulated and the extent to which they are regulated and enforced. In particular cases, it is conceivable that these differences might give rise to a competitive advantage in the jurisdictions with the less-stringent regulations.

- However, any such competitive advantage would be short-lived in that all jurisdictions are moving in the direction of increased regulation of industrial toxic effluents. To reap the benefits of such an advantage, be it in Ontario or a State, a company would have to be able to move and re-establish itself quickly in the new jurisdiction. An examination of the

toxics, which are used as guidelines in establishing permit levels. Massachusetts has established acceptable ambient air quality levels for over 100 air toxics, which are currently regulated through the permitting process. California currently is in the process of developing regulations establishing specific control requirements for a list of air toxics.

In the future, more States are likely to have more comprehensive lists of pollutants. However, of greater import is proposed federal legislation. The major component of any federal legislation, *which we consider likely to be enacted within one or two years*, will be a comprehensive list of pollutants for which control requirements will have to be established. One important piece of legislation in the House of Representatives contains a list of 187 air toxics. EPA would be required to establish control requirements for categories of sources of these pollutants within seven years. Another important piece of legislation in the Senate would require control requirements to be established for 11 specified chemicals within 18 months of enactment and an additional 213 chemicals within a ten-year period. These chemical lists are more comprehensive than the list in Regulation 308.

Basis

Air toxics regulation in the U.S., both at the State and federal level, is based primarily on an assessment of risk. Under Section 112, EPA has relied on risk analysis to identify and establish control requirements for pollutants of concern. Most States use risk assessments, either in reviewing permits on a case-by-case basis, or in establishing acceptable ambient air quality levels.

As described in the Section on State and federal programs, the methodologies, reference standards, and margin of safety criteria used for risk assessments vary from State to State and at the federal level.

It is difficult to compare the stringency of the resulting requirements to Regulation 308 since the basis of control requirements under Regulation 308 is still to be determined.

Technology Requirements

Federal requirements are not based on technology-based standards. Three States in our sample rely on technology-based standards. California is establishing control requirements based on lowest achievable level; however, additional controls can be required, if necessary, based on an assessment of risk. In Michigan, sources must demonstrate the use of best available control technology. In New Jersey, sources must demonstrate the use of state-of-the-art technology. Other States base control requirements on case-by-case risk assessment or pre-established ambient air quality guidelines.

While the wording of the technology-based requirements varies from State to State, the resulting requirements generally turn out to be similar. The evaluation typically includes an assessment of available technologies and the feasibility of utilizing them, taking into account costs and energy implications.

It should be noted that federal legislation in the U.S. (discussed above) is likely to require application of technology-based standards for all categories of sources emitting the listed pollutants.

(ii) level of regulation

Air toxics regulation in most States results in point source emission limitations embodied in permits. These limitations are most often based on modeling projected emissions against acceptable ambient air quality levels. At neither the federal nor the State level are there regulations establishing ambient air quality concentrations which may not be exceeded as a matter of law.

(iii) clarity and consistency

For those air toxics regulated by the U.S. EPA, it may be necessary to secure a State and federal permit. However, for most substances, the permitting authority will either be the State agency or the local agency within the State which is authorized by the State.

As noted, regulation of air toxics in the U.S. is not consistent among States. Even within States, permit conditions can vary depending on the location of a source.

New federal legislation is likely to result in greater uniformity, since its basic foundation will rely on technology-based standards. However, individual States will remain free to establish more stringent control requirements.

(iv) monitoring

Few States require sources to conduct comprehensive monitoring of their emissions. Thus, the continuous emissions monitoring requirement in Regulation 308 is more far-reaching than U.S. requirements. The only comparable requirement currently in the U.S. is the requirement to estimate and report all emissions of air toxics (as well as releases into water and land) on an annual basis. In addition, many States monitor ambient air concentrations for certain air toxics, and thus, can detect increases in emissions of those chemicals.

6.2.2 Enforcement

The federal government and most States are empowered to assess civil penalties for, or enjoin violations of, air toxics requirements. At the federal level, EPA has a relatively mature enforcement program, consisting of inspections, investigations and enforcement actions, for air regulations. Air toxics, as a component of overall EPA air enforcement, represents about 29% of the air enforcement case load (the remainder of cases involve conventional pollutants). As more air toxics are regulated by EPA, it is expected that this percentage will increase. However, no significant increase in the EPA enforcement effort is foreseen in the immediate future.

Enforcement of air toxic regulations at the State level is minimal at present. This is because most State programs are evolving, and settlements and discussions are perceived as the most efficient way of bringing about compliance. Two State regulators noted that the bases for control requirements in their States are sometimes open for debate. Thus, they are inclined against subjecting these requirements to judicial scrutiny in an enforcement case.

6.2.3 Economic Impact

Among our sample of States, only California has indicated that it has evaluated economic impacts of proposed regulations. Economic impact assessments are available for proposed California regulations establishing requirements for hexavalent chromium control measures for cooling towers as at January, 1989. Total costs of this regulation are US$2.1 million in the first year and US$2 million each year thereafter.

At the federal level, EPA evaluates economic impacts as part of its regulatory impact analysis procedure for all regulations. Thus, for the seven air toxics under regulation, such economic analysis has been conducted and is available.

Because of the likely federal legislation establishing a technology-based requirement for air toxics, future economic impacts are the more relevant basis of comparison. Rough analyses of these impacts have been performed by the Congressional Budget Office (CBO) and the Congressional Research Service (CRS), the major research organizations supporting the U.S. Congress. As the CBO study notes, it is difficult to assign a cost to regulation of air toxics, since many existing and proposed requirements relating to control of VOC's and particulates also result in control of certain air toxics.

A CBO paper[1] provided cost estimates for a comprehensive set of amendments to the Clean Air Act. These amendments would:

- o address compliance with the national ambient air quality standards for ozone;
- o limit emissions of pollutants causing acid rain;
- o impose new controls on mobile sources of air pollution;
- o redefine units of measurement for the national ambient air quality standards; and
- o limit routine and accidental emissions of air toxics.

Total costs of these initiatives were estimated to be between US$2.1 billion and US$13.8 billion, depending on various technical assumptions. These costs were judged by the authors to be "quite small", when compared to the value of shipments represented by the affected sectors.

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[1] "Estimates of Costs of Proposed Amendments to the Clean Air Act". CBO staff working paper. October, 1987.

6.2.4 Conclusions

There are significant differences between the current approach to the regulation of air toxics in the United States and the approach envisaged for Ontario in the draft amendments to Regulation 308. In particular, Ontario's proposed program is more comprehensive and detailed than programs in the U.S.. However, the States' programs are evolving. In addition, we judge that it is likely that there will be new U.S. Federal legislation controlling air toxics. It is not possible to predict now the toxics that will be covered and the implementation schedules that will be set.

Ontario-based plants could be placed at a competitive disadvantage compared to U.S.-based plants if the amendments to Reg. 308 are passed and enforced well in advance of comparable U.S. regulatory moves.

7.0 ONTARIO VS. OECD COUNTRIES

7.1 INTRODUCTION

Approaches to wastewater management by countries that belong to the Organization for Economic Cooperation and Development (OECD) vary based on the need to protect water supplies, the historical involvement of the national government with local issues, the relationship of government with business, and requirements of international agreements. Each country uses different modes of regulation, planning, enforcement, and technological innovation to manage toxic wastewaters.

The United States and Japan may have the most comprehensive set of laws and implementation and enforcement programs. Both countries have strong national laws and wastewater management programs that are operated by the states or provinces in conjunction with the federal government. Members of the European Community must follow common environmental standards and policies developed by the European Commission and adopted by the Council of Ministers. In addition, each country has its own laws and regulations which may be more stringent than Community standards. Many European countries leave pollution control to state or local authorities.

7.2 EUROPEAN COMMUNITY COUNTRIES

7.2.1 Water

In Europe, several types of standards have been established: standards for the river or surface water (water quality-based standards), limits on individual discharges, and drinking water and groundwater standards. Standards and enforcement come from both countries and from the European Communities (EC). As in the United States, approaches to pollution control in European countries include uniform standards and case-by-case screening and, within the standards approach, between ambient standards and technology-based source or product standards.

EC directives on the environment are designed (in theory) to bring uniformity of standards to the member countries in the 1980s. These include standards on water quality, drinking water treatment, toxic effluent discharges, and hazardous waste disposal. Possibly the most far-reaching action is the "Dangerous Substances" directive adopted in 1976 with the intention of reducing or eliminating water pollution by listed substances. The 1976 directive (76/464) provides a framework for the control of discharges of dangerous substances into the aquatic environment, establishing a "black list" (List 1) of very toxic substances the discharge of which should be eliminated and a "grey list" (List 2) of less toxic substances the discharge of which should be reduced. The List 1 enumerates eight categories of toxic substances:

1. Mercury
2. Cadmium
3. Organohalogen compounds
4. Persistent mineral oils and hydrocarbons
5. Organophosphorous compounds (pesticides)

6. Organotin compounds (pesticides)
7. Carcinogenous substances, and
8. Persistent synthetic substances.

The Commission's role has been to fix limit values and quality objectives for List 1 substances and to harmonize the national action programs for List 2 substances. Since 1976, five directives, dealing with six substances, have been adopted for mercury, cadmium, HCH (lindane), DDT, pentochlorphenol, and carbon tetrachloride. A total of 129 substances have been identified for urgent consideration as List 2 substances. Proposed directives have been issued for aldrin, dieldrin, and endrin; DDT and PCBs; and chromium (the first List 2 substance considered for action). The Commission is working on proposals for substances in all of the List 1 categories.

The EC Environment Ministers have also agreed on target quality standards that have been set for water to be used for human consumptions and on general water quality standards for stream use. Although river water is used for many purposes, its use as drinking water has usually determined the quality standards (the EC and in turn the member countries have various classifications of waterways by category of use, the highest category is for drinking water). In addition, 1976 conventions on the Rhine River and the Mediterranean against pollution and dumping (adopted by the EC in 1977), commit riparian states to cut back on the discharge of pollutants.

The EC Council of Ministers for environment is also considering important decisions governing environmental policies in major industrial sectors--the chemical industry, motor manufacture, energy production, and agriculture. The EC environmental programs envisaged that special legislation would be introduced to cover the pollutant effects of particular industries, starting with pulp and paper, titanium dioxide, and iron and steel, and moving on to fertilizers, petrochemical, leather, food, etc. These proposed programs elicited such opposition that proposal were only put forward for pulp and paper and titanium dioxide, and only that concerning the latter was adopted by the EC Council of Ministers.

Implementing these EC standards is complicated by a myriad of approaches and traditions to pollution control, transfrontier pollution, and economic competitiveness. The EC has a variety of administrative and legislative options to implement policies which are binding upon member countries. The main instrument of environmental policy has been the use of directives--which are binding as to the result to be achieved upon each member state, but leave to national authorities the choice of form and methods. These have been backed up in many cases by the definition of agreed monitoring procedures. To transform these directives into action, each member state must pass appropriate national legislation and then apply the legislation at the ground level. During both these steps, the objectives of the initial directives may be misinterpreted, distorted, or ignored. Where a member country does not implement the directive, in breach of treaty obligations, the EC Commission, after a warning, takes the case to the European Court of Justice. The majority of such cases concern the failure to adopt the necessary implementing measures. The more complex problem of how rigorously a directive is being applied in practice, and how effective in environmental terms the measures are, is more difficult to evaluate.

The Commission has taken action against several of its member states in recent years.

At the national level, the implementation and enforcement of water pollution control laws generally reflect a consensus privately worked out between government and industry--not on an independent analysis of basic questions or a cost-benefit analysis; European countries have resorted to a slow step-by-step approach to pollution control.

A difficulty in linking river water standards to individual discharge is the EC's principle of equal discharge rights for all industries. Singer (1982) quoted an official of the Amsterdam Water Supply:

> The activities of the EC in the environmental field cannot be detached from the initially economic premises which constituted the basis for the establishment of the Communities; of prime importance is the reduction or avoidance of a disturbance of economic competitive relations. This has led to the belief that there must be equal discharge rights for all industries. And this in turn leads to the drawing up of equal emission standards.

Such a policy is not sensitive to the goals of overall river quality. In addition, European governments draw back from burdening industry with fresh restrictions when it still cannot provide enough jobs. The Rhine River illustrates the dilemma. France and Germany, quick to blame Switzerland for the Basel spill from the Sandoz chemical plant November 1, 1986, are delaying the implementation of the 1976 convention on cleaning up the river. The French until recently resisted pressure to limit salt discharges from their potassium mines, which raises the chlorine level of the Rhine River. France planned to apply restrictions on salt emission starting in 1987. Germany has banned the dumping of only a handful of the 200-odd chemicals covered by the convention. One report noted that 100 percent of organic chlorine compounds are discharged without treatment into the Rhine River. Data from Dutch efforts to monitor discharges into the Rhine River show sharp increases in toxic pollutants opposite large chemical firms along the river.

In contrast to the United States, effluent charges are a common practice in Europe to provide incentives to control pollution. In practice, European charges are too low to induce polluters to reduce their emission enough to improve overall water quality significantly, especially in Germany and Great Britain. Local enforcement is made more difficult by industry threats to close a plant and because statistics concerning effluent discharges are considered confidential industrial information, especially in Germany. Some environmentalists in Germany are reported to be calling for best available technology instead of damage charges.

Europeans generally use a composite chemical measurement, total organic carbon (TOC), rather than readings of specific chemicals. This practice is similar to the total toxics water quality-based approach now being implemented in the U.S. to complement maximum contaminant levels for individual chemicals specified by EPA.

7.2.2 Air

7.2.2.1 Introduction

Control of toxic air pollutants in countries that belong to the Organization for Economic Cooperation and Development (OECD) has been effected indirectly through controls on conventional air pollutants such as particulates and more recently by regulations directly addressing organic compounds, heavy metals, and other toxic substances. This section describes toxic air pollution control and abatement programs in selected OECD countries, mainly Japan and member countries of the European Communities (EC). In general, the legislation and some of the regulations to control many toxic air pollutants are in place in these countries. New political pressures, especially in Europe, may encourage regulatory agencies to implement and enforce existing laws and to adopt more stringent new regulations.

Air pollution control in OECD countries during the past two decades centered on widespread pollutants created by the combustion or refining of fossil fuels. Emissions of carbon monoxide, sulphur dioxide, nitrogen oxides, and dust or particulate matter are coming under increasingly stringent regulation in OECD countries. Levels of these conventional air pollutants have declined in Japan and most European countries with the exception of Italy and the United Kingdom (European Commission, 1987; Environment Agency, Japan, 1985).

Some toxic air pollutants have been captured through controls on emissions of conventional pollutants especially particulates. Dusts can contain many organic compounds including volatile organics and chlorofluorocarbons, toxic metals such as cadmium and mercury, and radionuclides. In addition, regulations exist to control emission of lead, some hydrocarbons, and radioactive materials. Controls on automobile emissions, crude oil refining, and distribution of natural gas capture many organics. In recent years, legislation has been enacted to explicitly regulate emissions of certain toxic air pollutants by industrial facilities including organic compounds and heavy metals. Implementation and enforcement by local authorities of toxic air regulations is likely to increase in the 1990s.

Approaches to toxic air pollution management by OECD countries vary based on demographic and environmental characteristics; air quality standards, regulatory approach, and enforcement; relationships between national and local government and government and industry; and requirements of international agreements (see, U.S. Congress, 1985; European Commission, 1987). In general, administrative guidance is the preferred course taken to implement regulations in Europe and Japan; direct legal action against polluters is taken only as a last resort. Penalties authorized by environmental statutes are low, seldom imposed, and not seen as a strong deterrent for polluters (see Burks, 1988). Although progress is slow, all of the major OECD countries appear to have made a commitment to improve air quality: air quality standards are being implemented and enforced and ambient air quality has become cleaner during the past two decades in many regions of OECD countries (U.S. Congress, 1985; Environment Agency Government of Japan, 1985; European Commission, 1987).

7.2.2.2 Environmental Laws and Regulations

(I) Directives of the European Communities

Environmental regulation in Europe is becoming a European-wide activity for two reasons: 1) environmental impacts cross frontiers, and 2) the impetus for stricter regulations is coming EC directives. Member countries and the EC both enact environmental legislation and enforce regulations. Member countries must follow common air pollution standards and policies developed by the European Commission and adopted by the Council of Ministers. In addition, each country has its own laws and regulations which may be more stringent than Community standards. Many European countries in turn leave pollution control to state or local authorities.

Although the EC has limited legislative and enforcement powers, its institutions are establishing minimum emission standards that member countries are gradually adopting. During the past five years the EC has issued directives (which have the force of law and must be implemented by member countries) aimed at reducing most industrial air pollutants, including toxics. Implementation of the directives is left up to the member countries as is the actual limit or standard set for most toxic air pollutants. The growing attention to environmental issues in Europe may foster the political will to implement the EC directives and for the EC to enforce the directives. An unprecedented number of intergovernmental meetings dedicated to the control and cleanup of man-made pollution took place in Europe during the past year (Wright 1989; The Economist, May 6, 1989). The "greenhouse effect," smog from car exhaust, chlorofluorocarbons (CFCs), acid rain, and industrial toxic pollutants are among the prominent issues.

In addition to pollutant or industry specific directives, the Single European Act of 1986, the EC's effort toward closer integration by 1992, may require the harmonization of member country environmental rules and stricter standards. However, because of different national standards and practices, achieving agreement on harmonization of EC-wide toxic air standards may be difficult.

<u>European Communities Directives</u>

EC directives on air pollution are designed (in theory) to bring uniformity of standards to the member countries and to radically reduce major air pollutants, including toxics, in the 1980s and 1990s. Important directives on air pollution by industrial plants and by large combustion plants encompass many toxic air pollutants. The outline of the directives given below is drawn from the directives themselves and from Commission publications on EC environmental policy. A list of the directives through 1987 is provided in Vol. II: III.

Directive 84/360 "Air pollution from industrial plants" (1984) is intended to prevent or reduce air pollution from industrial plants, particularly in the following industries:

- energy;
- production and processing of metals;
- manufacturing of non-metallic products;

- o chemicals;
- o waste disposal; and
- o paper pulp.

Subcategories of these industries are also listed and are provided in Vol II:III. The directive also lists the most important polluting substances:

1. Sulphur dioxide and other sulphur compounds
2. Oxides of nitrogen and other nitrogen compounds
3. Carbon monoxide
4. Organic compounds, in particular hydrocarbons (except methane)
5. Heavy metals and their compounds
6. Dust; asbestos (suspended particulates and fibers), glass and mineral fibers
7. Chlorine and its compounds
8. Fluorine and its compounds

Under the directive, the authorizing agency in the member country must ensure that operation of new plants in the industries listed above "does not result in a significant level of air pollution" (emphasis added). Member states are required to adopt policies for the gradual adaptation of existing plants to the best available technology, but no time limit is set for this. The directive does not stipulate any maximum values for polluting substances but it provides that the Council of Ministers (the legislative or decision making body of the EC) may fix emission limit values at some subsequent date. Information detailing and comparing limits for toxic air emissions under Directive 84/360 in each member country could not be readily identified for this study. For sulphur oxides and nitrogen oxides these limits are already in existence via Directives 80/779, 85/203, and 88/609 and for dust in 88/609.

Directive 84/360 has to be considered together with a recent directive on combustion energy producing plants larger than 50 megawatts (Directive 88/609, November 24, 1988) enacted in part to reduce acid rain. The directive requires member states to adopt programs no later than July 1, 1990, to reduce the total annual emissions from existing plants by the following amounts: up to 70 percent for sulphur dioxide and up to 40 percent for oxides of nitrogen (the percentages vary by country). Dust is also to be reduced for existing plants. The directive also sets limits for dust, sulphur dioxide, and nitrogen oxide for new plants. Some toxic air pollutants are likely to be controlled by this directive.

The Council has adopted several measures to reduce CFCs and asbestos (see Vol. II for details). The asbestos directives protect of workers exposed to asbestos (83/447) and prohibit marketing products containing crocidolite (one of the fibrous silicates known as asbestos--83/470). In addition, directives on the disposal of hazardous waste (78/319), and pollution from industrial plants (84/360) include asbestos controls.

The 1986 accident at the Chernobyl power station focused attention on the need to develop EC safeguards on radioactive pollution. Several proposals have been advanced by the Commission which may eventually become Council directives.

The growing political support for pollution control in Europe and the 1992 process may engender stricter EC air pollution standards during the next few years. The

Single European Act stipulates that the Commission's proposals for environmental protection "will take as a base a high level of protection" (Economic and Social Consultative Assembly, 1987).

The Council of Ministers for environment is also reportedly considering important decisions governing environmental policies in major industrial sectors--the chemical industry, motor manufacture, energy production, and agriculture.

New EC legislation may be written to the strictest standards present in member countries or else the EC may have to encourage some countries to lower their standards in the interest of harmonization. Alternatively, the EC could adopt ambient air quality standards, leaving producers to adopt different emission levels as long as the air in the member country meets the ambient standard. In the past, progress toward EC-wide action has often been dictated by the pace of the member country slowest to adopt environmental controls.

Implementation of Directives and
European Communities Enforcement

Implementing these EC standards is complicated by widely varying air pollution standards in member countries, transfrontier pollution, and economic competitiveness. The process of implementing the existing air pollution directives and of harmonizing environmental standards as part of the 1992 process may impose significantly different economic impacts on member countries (see The Economist, May 6, 1989). Economic studies on the impacts of harmonizing the environmental regulations of EC member countries have either not been conducted or were not identified in our study.

The EC has a variety of administrative and legislative options to implement policies which are binding upon member countries (see discussion in water pollution section of this report). Directive 84/360 on air pollution from industrial plants contains the phrase "does not result in a significant level of air pollution." Each member country may define "significant" in a different way. However, the EC could take a country to the European Court of Justice under Directive 84/360 for failing to make progress on establishing regulations and for failing to enforce industrial toxic air emission regulations.

At the national level, the implementation and enforcement of air pollution control laws (as with water pollution laws) generally reflect a consensus privately worked out between government and industry--not an independent analysis of basic questions or a cost-benefit analysis; European countries have resorted to a slow step-by-step approach to pollution control (see Pedersen, 1985; Singer, 1982; European Commission, 1987; International Environmental Reporter, March 9, 1988).

The accuracy of information and data collection by the EC and member countries on air pollutants suffers from a lack of field data measurements to calibrate estimates based on indirect measures such as rate of fuel use (European Commission, 1987). Data on emissions from industrial facilities is often confidential. Improved data collection may speed implementation of environmental standards. The environmental impact assessment process adopted by the EC in 1985 obliges member states compliance in 1988 and will make information on new large industrial,

infrastructure, and waste disposal projects available to the public and other affected countries for comment (Commission, 1987). The EC's inventory of chemical substances commercially available (similar to the U.S. Chemical Abstract Service with registry numbers) designed to strengthen the EC's system of substances registration and control may aid in toxic air pollution control.

(ii) Federal Republic of Germany

Damage by acid rain to the Black Forest and concerns about the hazards of radioactive waste from an expanding German nuclear power industry are among the key concerns of the West German environmental movement (Wright, 1989). Serious air pollution due to the emission of massive quantities of toxic substances is a particular problem in the heavily industrialized areas of the Ruhr and most urban areas (European Commission, 1987). Under public pressure, German authorities have demanded that Ruhr factories adopt stricter air-emission limits than the EC norm (The Economist, May 6, 1989).

Legislation on air pollution includes the law to regulate the introduction of harmful discharges into the air (Bundes-Immissions-schutzgesetz) and regulations issued on the basis of this law. Technology-based emission standards have been established by the national government for most major categories of new and old stationary sources. Similar to the U.S. and Japanese laws, further emissions control may be required in areas not meeting ambient standards (U.S. Congress, 1985).

Industrial plants must comply with specific regulations set out in the law, which also lays down specific quality requirements for plant operation, materials used, and products. This makes it possible to regulate product types, preventing the use of dangerous substances. Regulations define limit values for emissions which must be respected by those wishing to obtain operating licenses for industrial activities, methods for calculating the diffusion of noxious substances, measurement and evaluation methods, the height of chimneys, and requirements for the renovation of old and dangerous plants. Since 1979, plants with operating licenses must submit an annual report of the types of emission generated by the production processes used in their plant. Areas with high levels of air pollution are required to have clean air plans and emission registers and the law makes it possible to restrict industrial activity and automobile traffic.

Implementation and enforcement of air pollution laws in West Germany remains largely in the hands of its eleven states. West Germany amended its penal code in 1980 to redefine non-compliance with environmental laws as a serious crime and not a petty offense. Over 16,000 environmental offenses (fo. all media) were registered in 1987, most by private citizens. However, 80 to 97 percent of criminal proceedings against institutions and industry for environmental offenses are never brought to trial (Burks, 1988). Government and industry have a long tradition of working closely together in Germany to set and regulate emissions. Industry is required to self-monitor.

No direct subsidies are available for pollution control equipment (U.S. Congress, 1985). Loans may be granted at low-interest rates by some state and other programs. Accelerated depreciation is allowed on investment in control equipment (by not on in-plant process change).

(iii) France

A variety of decrees, laws, and ordinances regulate air pollution in France. Industrial plants covered in EC Directive 84/360 correspond from an administrative viewpoint to French legislation on air pollution limits for "classified plants" (installations classes). The Ministry of Environment has issued regulations on industrial emissions for many industries. Pollution reduction is achieved through a combination of direct controls, pollution taxes, and grant programs. Local authorities can require emissions reduction when authorizing new facilities or modifications of facilities. Explicit limits on certain air pollutants follow EC directives.

In January 1986, a system of air pollution taxes came into effect as a primary means of enforcing air pollution regulations (see Bureau of National Affairs, International Environmental Reporter, February 12, 1986). The new program was motivated by a French government pledge to reduce sulfur dioxide emissions by 50 percent between 1980 and 1990. The tax rate is tied to the level of pollution at a plant and the tax monies are redistributed among the paying companies for use on new pollution-reducing technologies. This "stick and carrot" economic incentive approach to pollution control has been used in France since 1964 for water pollution control. The French approach is different from the traditional direct control approach of emissions process and product standards common in most other countries. In the case of water pollution control, the tax has not been set high enough to encourage polluters to cut wastewater discharges.

Significant reductions in conventional air pollutants have been recorded in France, as in most other European countries since 1974. In the State of the Environment Report, 1986, the French Environment Ministry reported that the levels of high acidity over major cities fell 50 percent from 1974 to 1985, sulphur dioxide emissions by 55 percent, and particulate matter by 38 percent (largely due to reduced coal use and improved dust collection). However, hydrocarbon emissions were reported to have increased due to activities in the transport sector and by industries using solvents (Bureau of National Affairs, International Environmental Reporter, May 13, 1987).

(iv) United Kingdom

Toxic and conventional air pollution controls are enforced by local authorities and the centralized regulatory agency, H.M. Inspectorate of Pollution. About 50,000 industrial facilities have emissions to the air which require the attention of control authorities; most are the responsibility of local governments. Of the 50,000 facilities, some 2,000 to 3,000 have processes which are deemed by law to need the attention of a professional, central government agency in order to properly understand and control the physiochemical reactions involved.

Controls by the Inspectorate of Pollution are based on the examination and authorization of process technology and operational practices at plants that use a "scheduled" process--or a process that is specifically listed by the government and is subject to direct controls. Existing air pollution control legislation is based on the Control of Pollution Act of 1974 which imposes a general duty to use "best practicable means" to limit emissions. Scheduled processes are listed in Part A of

the December 1986 Department of Environment publication Air Pollution Control in Great Britain: Review and Proposals. The Inspectorate takes the current state of technology (best available technology), EC and national standards and quality objectives, environmental risks, and cost of controls into account when reviewing a scheduled process.

Environmental laws in England and Wales will be revised to integrate pollution control across media, the United Kingdom Environmental Secretary Nicholas Ridley announced August 4, 1988 (Bureau of National Affairs, International Environmental Reporter, September 1988). The Inspectorate of Pollution will have powers to enforce pollution control in an integrated manner across media: air, water, toxic substances, solid waste, and hazardous waste. The Inspectorate already administers air and hazardous waste pollution control for certain facilities. Processes involving the list of 26 toxic substances found in wastewater on the government's "Red List" will also be subject to the Inspectorate's authority.

British government officials, led by Prime Minister Margaret Thatcher, have been active in recent meetings on global air pollution, the "greenhouse effect," and CFCs. Until this past year, the United Kingdom had been one of the most recalcitrant members of the EC, delaying or vetoing EC environmental directives.

(v) Netherlands

Air pollution caused by industry is regulated by the Air Pollution Act (Wet inzake Luchtverontreiniging). Industries may be required to obtain a permit concerning air emissions from the Province for new facilities or for expanding or changing existing plants. The permit is commonly issued under conditions requiring installation of control equipment or processes, limiting discharges, and requiring information about emissions. Permits are required for electric power stations, oil refineries, large chemical plants, blast furnaces, large foundries, refuse incineration plants, sugar refineries, and those involved in the storage or transshipment of ore, coal, or oil. In addition, the area around Rotterdam is designated a "cleaning up area" which requires further measures to reduce industrial and automobile air pollution.

7.3 JAPAN

7.3.1 Water

Japan has among the most stringent of environmental standards. The limited amounts of habitable land in the country causing a high national population density (744 persons per square mile in 1970) contribute greatly to this position. Additionally, two tragic accidents, known colloquially as "Minamata" disease (organomercury poisoning) and "Itai-Itai" disease (cadmium poisoning), spurred invokement of a strong environmental posture.

Water pollution control includes both uniform national water quality-based standards for designated stream uses and national effluent standards. The underpinning is its Basic Law for Environmental Pollution Control of 1967. Its enactment established a water quality code relating to health and the natural environs. A 1970 amendment allowed prefectural governments to adopt and enforce

more stringent standards than the national code. It further authorized the regional states to set effluent standards for those pollutants not regulated by the federal code. All prefects carry ordinances more strict than the central government.

The standards for protection of human health are stipulated for nine items: cadmium, cyanides, organic phosphorus, lead, chromium, arsenic, total mercury, alkyl mercury, and PCBs. In most cases, the values adopted are the same as those specified by Japan's water quality standards for water supply. The second category provides standards, including BOD, COD, and DO for rivers and total nitrogen and total phosphorus for lakes, for preservation of the living environment.

Discharge standards are established by regional or prefectural authorities. The Water Pollution Control Law lays down uniform national effluent standards for specified facilities. For those water areas where it is judged that the uniform national standards are insufficient to attain the environmental quality (water quality-based) standards, the law provides that stricter standards can be set under prefectural ordinances. Since 1975 all the prefectures have put such more stringent prefectural effluent standards in force. By the end of March 1984, 590 of the 1,100 industrial sectors classified by the government, came under the control of water pollution control regulations (Environment Agency, Government of Japan, 1985).

The regional implementation of effluent standards allows the prefectural great latitude in assigning limits to individual pollution sources per given region. Limitations can be shifted according to cost in context with other pollution sources and the containment/restoration ability of the wastewater treatment centers for that area.

7.3.2 Air

Japan's air quality standards are often stricter than those in other OECD countries. However, the most limiting standards are sometimes designed to protect property such as structures and agriculture in addition to human health. While these standards may be codified by the government, they may not always be enforced to the degree health standards are (U.S. Congress, 1985).

The Air Pollution Control Law stipulates various restrictions on facilities emitting soot and smoke, particulates, and specific substances. Much of the material in this subsection on Japanese air quality standards is taken from publications of the Environment Agency, Government of Japan unless referenced otherwise.

Japan employs both ambient air quality standards and technology-based discharge limits. Ambient standards, enacted at both the national and prefectural levels, are not binding but serve as objectives (for comparison of United States and Japanese approaches see U.S. Congress, 1985). Discharge standards are set at the national level and administered by local governments. Prefectural governments can tighten national discharge standards to ensure that quality standards are achieved in their area.

Particulate matter, which can contain many toxic substances, is divided into two classes for regulation, dust fall and suspended particulate matter. Particulate matter is further classified into two categories; one is "soot and dust" generated as a result of fuel combustion, the other is "particulates," any substances discharged or scattered as a result of mechanical treatments such as crushing. Emission standards for soot and dust are specified for each type and scale of dust emitting facilities, and more stringent standards apply to new facilities and to facilities in areas suffering from air pollution. National environmental air quality standards for conventional air pollutants and for soot and dust are provided in Vol. II: III. Local authorities may apply more stringent standards in some cases.

In addition to nitrogen oxides (defined as a toxic substance in Japan), the law designates four groups of chemicals substances as toxic and stipulates control of their emission levels:

1. cadmium and its compounds,
2. chlorine and hydrogen chloride,
3. fluorine, hydrogen fluoride and silicon fluoride, and
4. lead and its compounds.

Industrial emission standards have been promulgated for a limited number of these toxic substances that are generated from specific raw materials. The small amount of solid particles not explicitly specified is placed under regulation as "soot and dust" irrespective of the components they contain. Emission limit values for toxic harmful air pollutants and for offensive odour substances are also provided at Vol. II: III.

Hydrocarbons emitted from point sources have also been regulated since 1982 to help combat photochemical smog.

Japan has an established air quality monitoring system with monitoring stations that record conventional air pollutants and toxic pollutants (mostly organic substances and heavy metals) in suspended dust and particulates. Data compiled by the Environment Agency indicates that compliance rates with ambient suspended particulate regulations rose from 22.4 percent of monitoring stations in 1978 to 49 percent of stations in 1984 (Environment Agency, Government of Japan, 1985).

Japanese officials interviewed for a Bureau of National Affairs study on enforcement of environmental regulations (Burks, 1988) said current enforcement practices of statutes are effective, although accurate data on violations were usually unavailable. In Japan, administrative guidance is the preferred method of enforcement, direct legal action is taken only as a last resort (U.S. Congress, 1985; Burks, 1988). Local officials performed 90,127 air pollution inspections at the nation's 188,386 registered facilities in 1986 with air emission permits. Of the inspections, 6,689 involved measuring air emissions exceeding emission standards. Authorities issued less than 2,000 administrative warnings in 1986, less than half the number of 1980 when 86,196 inspections were performed (Burks, 1988). Maximum penalties for facilities or their officers that fail to comply with administrative orders are not more than one year in prison or a fine of not more than 200,000 yen (about $1,600).

Accelerated depreciation, low interest loans, and grants are permitted or available from the government for pollution control equipment or process changes (U.S. Congress, 1985).

PART III

SUMMARY OF FINDINGS AND CONCLUSIONS -

HOW DOES ONTARIO STACK UP AGAINST THESE SELECTED JURISDICTIONS?

CONTACTS FOR ECONOMIC IMPACT STUDIES

NAME	POSITION AND ORGANIZATION	REFERRED BY
GOVERNMENT		
Andre Guay*	Corporate Planning Group, Environment Canada (819) 997-2206	Glenn Munroe
Michelle Gosselin*	Chief, Socio-economic Analysis Division, Environment Canada (819) 953-1171	
Sherry Watson	Associate Director, Industrial Programs Branch, Environment Canada (819) 953-1114	
Ted Will	Environment Canada, (819) 994-5195	Glenn Munroe
Bill Blakeman	Mining, Mineral and Metallurgical Process Division, Industrial Programs Branch, Environment Canada (819) 953-1103	
Doug Tilden	Management and Emergencies Branch, Environment Canada (819) 953-1700	
Jacques Briosson	Senior Advisor, Socio-Economic Analysis, Environment Canada (819) 997-2377	
Dr. E.C. Chen	Environment Canada (819) 953-1132	Jim Robertson
Raymond Perrier	Environment Canada (514) 283-0178 (he was previously with the Bureau de coordination de la strategie in the Quebec Ministry of the Environment)	
Harvey Lazar*	Director, Office of the Chairman, Economic Council of Canada (613) 952-1710	Carl Sonnen
Jackie La Fortin	Director, Publications, Economic Council of Canada (613) 952-2138	
Henri Saint-Martin	Directeur, Direction de coordination de la recherche et du development, Quebec Ministry of the Environment (418) 643-2073	

SUMMARY OF FINDINGS

All of the jurisdictions examined are in the midst of major changes in their regulation and regulatory enforcement of the toxic effluents and emissions of industries. This complicates the task of comparing the various regulatory approaches, as all of them are changing simultaneously. It is not always obvious what regulations will result nor when any such regulations will be promulgated.

A detailed summary of our technical findings is presented in Tables I, II and III which are located in the Executive Summary. Below we present our general findings arising from this comparison.

A. EXTENT OF REGULATION

A.1 WATER

1. All the jurisdictions are moving, and sometimes dramatically so, in the direction of increasing regulation of industry's toxic pollutants. The various agencies involved in developing the regulatory approaches are copying liberally from each and share information freely.

2. All of the North American jurisdictions examined are working from similar lists of water-discharged chemicals and substances to be regulated. In the U.S., effluent limits have been set for many of the identified substances while in the Canadian Provinces, the discharge limits have not yet been set. However, BACTEA is the preferred method in both places, industries are similar, and access to technology is similar.

3. Of the Canadian Provinces, Ontario is the furthest ahead in developing regulations for toxics. Quebec has placed high priority on the issue, and may introduce regulations at about the same time as Ontario.

4. Risk assessment is the basic method used in all of these jurisdictions for determining whether or not a substance should be regulated.

5. All of the North American jurisdictions regulate, or are moving to regulate, point source emission standards for the designated toxic chemicals and substances. As well, most of the jurisdictions are augmenting these emission standards with overall ambient standards for the receiving medium and, for water discharges, with water quality standards based on the proposed use of the receiving medium. The proposals being considered by the Ontario government do not represent a major divergence from the practices being considered elsewhere.

6. In the U.S., the EPA regulations establish a floor for the control of industrial toxic effluents. The majority of the States have been granted the right to administer both the EPA and States' programs. Only in a small number of States are industries required to apply to two different jurisdictions to obtain permits for their plants. In Canada, the equivalency conditions of CEPA should act to ensure that federal and Provincial regulations are not in conflict.

This is based on the assumption that CEPA is not challenged by the Provinces and overturned in the Courts.

7. All of the North American jurisdictions are proposing increased monitoring and reporting as part of new regulations.

8. The European Community countries examined appear to be lagging behind all of the North American jurisdictions in the scope and vigour with which they are implementing water toxics environmental protection regulation. The two main causes of this lag appear to be the multiplicity of jurisdictions involved in regulating water quality and the strength of industry's opposition to improvements.

A.2 AIR

There are significant differences between the current approach to the regulation of air toxics in the United States and the approach envisaged for Ontario in the draft amendments to Regulation 308. In particular, Ontario's proposed program is much more comprehensive and detailed than programs in the U.S. However, the States' programs are evolving and experts believe that the U.S. Federal government will act to regulate air toxics within two years.

B. ENFORCEMENT OF THE REGULATIONS

B.1 WATER

1. All of the North American jurisdictions are committed, at least publicly so, to increasing their enforcement activities. The enforcement system of Ontario is spoken of as a valuable model by representatives of the two other Provinces surveyed.

2. All the jurisdictions also claim that their approach to date has been one of negotiation first, with enforcement following only if negotiation fails. As part of the overhauls of the enforcement system, increased emphasis is going to be placed on mandatory compliance. The provisions of Ontario's proposed regulations are not out of line with approaches being developed in the other jurisdictions.

3. All jurisdictions report that inadequate resources have been allocated to enforcement. In the U.S., lack of staff and money have hampered EPA and State permitting and enforcement activities. Reviews of EPA's and States' CWA activities by the U.S. General Accounting Office (GAO) and the U.S. Congress Office of Technology Assessment (OTA) generally indicate that progress is being made but that it is too slow and does not meet legislative deadlines, that regulations allow for substantial loopholes in compliance, and that staff and budgetary resources are inadequate to implement the programs. In addition, environmental groups such as the Natural Resources Defense Council have brought citizen suits against major dischargers to force more rapid compliance with effluent regulations. The response of the Bush Administration to this criticism is uncertain.

4. On a per capita basis, Ontario spends three times as much on enforcement as does the U.S. EPA.

B.2 AIR

The current U.S. EPA enforcement program is comparable to that envisaged for Ontario's Reg. 308, albeit for a much smaller number of chemicals and substances.

C. ECONOMIC IMPACTS OF THE REGULATIONS ON THE AFFECTED INDUSTRIES

1. The jurisdictions examined are uneven in the emphasis that they have placed on identifying the costs to industry of complying with the proposed regulations of toxic substances.

   - o Ontario has done a comprehensive study of the likely costs of complying with proposed changes to its air toxics control proposals. To date, only the initial monitoring phase of MISA has been costed, not the subsequent toxics abatement phase.

   - o The EPA in the U.S. has carried out extensive analyses of the costs to industries of complying with its regulations of toxics discharged to the waterways but few studies on the costs of complying with draft regulations on the control of toxic air emissions.

   - o The other Canadian jurisdictions have done very few studies on compliance costs, or have not released the results of the work that has been done.

   This makes it difficult to compare compliance costs across the jurisdictions. However, all share one common feature; all expect that the industries that generate the toxics will pay the large part of the costs of complying with the new regulations.

2. The conclusion of the U.S. EPA studies on costs of complying with water effluent standards is that the costs have been insignificant when compared to financial indicators for the sectors, with the possible exception of the organic chemicals sector. As noted above, Ontario does not yet have costs to compare against these EPA estimates and so no conclusion can be drawn about a possible competitive advantage.

3. Ontario's study of air toxics concluded that the costs of compliance in all of the sectors were significant. However, many of the sectors could probably absorb the compliance costs. A major exception was the petroleum refining sector which would be hit very hard. Several other sectors could experience an erosion in their competitive position if the competing jurisdictions did not pass similar regulations quickly.

4. All of the jurisdictions examined had a wide variety of industrial support programs that could be used, directly or indirectly, to defray at least part of the costs of complying with new pollution regulations. However, only the Canadian jurisdictions benefited from a major tax program aimed directly at compliance costs, i.e the Federal government's accelerated capital cost allowance permitted for such equipment. This offers Canadian industries a significant advantage over their foreign competitors.

CONCLUSIONS

These findings lead to the overall conclusions which are as follows:

CONCLUSION #1: All of the North American jurisdictions and Japan are moving in similar directions regarding the regulation of toxic water discharges. The chemicals to be regulated and the technical basis for setting the regulations are similar. However, their implementation schedules do vary.

The U.S. jurisdictions examined have been operating for several years now under toxics regulations that are in line with the MISA proposals.

Any business competitive advantage which exists because of regulatory differences will likely be due to variations in implementation timing or slightly different effluent standards. Such advantages will probably be of a fairly short-term duration. To benefit from such a competitive advantage, a company would either have to be quite mobile, capable of quickly moving, establishing itself and operating for a sufficient period of time to recoup the disruption costs, or have existing plants in the less-stringent jurisdictions to which production could be shifted. In any event, the U.S. experience with the costs of complying with toxics regulations is that these costs are not significant and get absorbed in the costs of doing business (see #4 below).

The European Community countries appear to be lagging behind Ontario and other North American jurisdictions because of conflicts over the use of common rivers and the reconciliation of pollution abatement goals with those of economic growth.

CONCLUSION #2: The regulation of air toxics presents a different situation. It is possible that the passage of Ontario's proposed amendments to its Regulation 308 could place some Ontario business sectors at a competitive disadvantage relative to their U.S. counterparts, if Ontario moved well in advance of the U.S.. This disadvantage would be eliminated only if the U.S. federal government, or a large number of States, accelerated their consideration and passage of air toxics regulations.

CONCLUSION #3: All jurisdictions are operating from the assumption that the industries creating the toxic effluents should bear most of the costs of complying with the new regulations. Thus, there is no competitive advantage from this perspective. Firms operating in Canada, however, have a significant advantage over their U.S. counterparts in the accelerated capital cost allowance that the Canadian firms are permitted on their purchases of equipment for purposes of pollution abatement and control. U.S. companies have no comparable program.

CONCLUSION #4: Many U.S. industries have been subjected to water toxics standards for several years now, similar to those being considered under MISA. Thus, to the extent that these U.S. toxics regulations did impose costs, then Ontario industry has had a competitive advantage over its U.S.-based competitors for this period of time.

Almost all U.S. sectors were concerned at the onset of the regulations that their business would be adversely affected. We have not identified any major studies carried out by the affected industries documenting the extent to which their sector was, in fact, adversely affected by the regulations. This, coupled with the initial EPA estimates that showed most of the costs to be insignificant, leads us to conclude that the actual costs were just absorbed by the affected firms.

APPENDIX 1

LIST OF CONTACTS

Jacques Gagnon	Directeur des strategies et des politiques environnementales, Quebec Ministry of the Environment (418)643-1852	Henri Saint-Martin
Claudette Begin	Direction des strategies et des politiques environnementales, Quebec Ministry of the Environment	Jacques Gagnon
Claude Souvien	Quebec Ministry of the Environment	Claudette Begin
Gui Demers	Industrial Strategy for Abatement, Quebec Ministry of the Environment (418)644-3422 or (418)646-4336	Raymond Perrier
Gerry Lack	Director, Standards and Approvals, Alberta Environment (403) 427-5883	Maralin Sanderman
Eric Moelle (for Bill Schnitzler)	Alberta Energy Resource Conservation Board (403) 297-8408	Gerry Lack

INDUSTRY ASSOCIATIONS AND REPRESENTATIVES

Liz Siwicki	V.P. Trade Policy, Canadian Textile Institute (613) 232-7195	
Jim Robertson	V.P. Human Resources, Canadian Textile Institute (519) 481-7322	Liz Siwicki
David Finlayson	Technical Services Manager, Canadian Chemical Producers Association (613) 237-6215	
Bill Neff	Canadian Chemical Producers Association (613) 237-6215	Don Gamble
Don Kennedy	Executive V.P., Canadian Foundry Association (613)232-2645 and Executive V.P., Steel Casting Institute of Canada (613) 232-2645	
Gary Nash	Mining Association (613) 233-9391	Bill Blakeman
Mr. Denomme*	Economist, Canadian Manufacturing Association 363-7261	
Peter Waisamen	Regional Manager - Ontario Region, Canadian Portland Cement Association 920-4566	

Don Romanko	Managing Director, Canadian Steel Producers Association (613) 238-6049	
Elizabeth Gardner	Ontario Mining Association 364-9301	
Fraser Craig* (Algoma)	Chairman, Canadian Steel Environmental Association (705) 945-2437	
Alan Baxter	General Manager, Ready-Mix Concrete Association of Ontario 743-5260	
Nancy Stevenson	Society of the Plastics Industry of Canada 449-3444	
Cork McKidden	Staff Economist, Canadian Petroleum Association (403) 482-4891	
Dr. Chris Kempling	Environmental Affairs Division, Esso Petroleum Canada (416) 968-5531	George Brereton
George Brereton (or Bob Fern*)	Ontario Petroleum Association 492-5677	Ron Denning
Dr. John Teflo	Celanese (Milhaven Plant) (613) 389-2210	
Michael Robertson	PetroCanada (403) 296-8824	Ron Wallis
Wayne Speller	PetroCanada (403) 296-3506	Michel Robertson

ACADEMICS AND OTHER ENVIRONMENTAL PROTECTION EXPERTS

Al Lucas	Faculty of Law, University of Calgary (403) 220-7115	Don Gamble (re study on the env regs of oil and gas in the arctic around 83-85)
Owen Saunders	Research Associate, Canadian Institute for Resource Law, University of Calgary (403) 220-3975	Don Gamble
Michael McGonigal	Professor, Faculty of Law, Simon Fraser University (604) 291-3696	
Dr. Ron Wallis	Dominion Ecological (403) 262-7350	Don Gamble
Martyn Riddle	V.P. Environmental Division, Monenco Consultants Limited. 743-3456	

Anil Somani	Wastewater Engineer, Monenco Consultants Limited. (403) 298-4593	Martyn Riddle
Carl Sonnen	Vice-President, Informetrica Limited (613) 238-4831	
Peter Victor	Partner, VHB Consulting 964-6452	
John Jackson	Environmental Protection Expert and Author (519) 744-7503	
Ron Denning	General Manager, Lambton Industrial Society (519) 332-2010	
Rose Simpson	Marketing, Control and Metering Ltd. 626-8411	
Peirre Debroux	Intech (management consultants to Dominion Textiles) (514) 989-6050	Jim Robertson
Hendrick Sire	Siefer Mueller International (613) 236-4318	Don Gamble

RESEARCH ORGANIZATIONS

Belinda Coopersmith	Executive Director, Canadian Water and Wastewater Association (613) 237-2965	
Don Gamble	Rawson Academy of Aquatic Science (613) 563-2636	Belinda Coopersmith
Al Davidson*	Environmental Advisor,Institute for Research in Public Policy (613) 238-2296	Don Gamble
Kerry Nattila	Manager, Petroleum Association for the Conservation of the Environment (613) 236-9122	
Elizabeth Swanson	Legal Counsel, Environmental Law Centre (403) 482-4891	
Mrs Eichmanis	Librarian, Institute for Environmental Studies, University of Toronto 978-7429	
Dr. David Pengelli	Urban Air Group/Air Pollution Control Association, McMaster University (416) 525-9140	

Tony Wagner	Director, Ontario Region Inland Waters Directorate (Canadian Association on Water Pollution Research and Control (416) 336-4532
Mary Vise	Librarian, Canadian Environmental Law Association 977-2410
Bill Andrews	West Coast Environmental Law Research Foundation (604) 684-7378
Maralin Sanderman	Western Canada Pollution Control Association (403) 259-4041
Marie-Josee Hein	Law Reform Commission (613) 992-2874
Mark Stefanson	Director of Communications, National Task Force on Environment and the Economy (204) 945-4742
Gerry Henderson	Executive Director, Canadian Council of Resource and Environment Ministers 739-4693

INTEREST GROUPS

Danielle Belair	Administrative Assistant, The Council of Canadians
Glenn Munroe	Pollution Probe 926-1907
Henry Hynd	Staff Representative, United Steel Workers of America 626-6332
Representative of	Friends of the Earth (613) 230-3352

CONTACTS FOR ENFORCEMENT ACTIVITIES

NAME	POSITION AND ORGANIZATION	REFERRED BY
GOVERNMENT		
Pat Hollett	Assistant Director, Investigations and Enforcement Branch, Ontario Ministry of the Environment (416) 440-3507	
Al Schultz	Pollution Control Division, Alberta Environment (403) 427-6209	
Linda Duncan	Chief, Enforcement and Compliance Division, Conservation and Protection, Environment Canada (819) 953-1173	
Alain Robert*	Directeur des Inspection Enquetes, Ministere de l'Environnement de Quebec (418) 643-6185	
Mr. Fernand Whitton	Director, Inspections Branch, Ministere de l'Environnement de Quebec (418) 643-6185	

*Attempts have been made to contact these individuals, but circumstances prevented us conversing with these individuals.

LIST OF CONTACTS

FEDERAL

EPA Office of Water Regulations and Standards

Industrial Technology Division:

Tom O'Farrell, Acting Director	202-382-7120
Joe Vitalis, documentation	382-7172
Dennis Ruddy, petroleum	382-7165
Woody Forsht, organic chemicals	382-7190
Matt Jarrett, mining	382-7164

Criteria and Standards Division:

David Sabock, Chief, Standards	475-7318
Kent Ballentine, ambient stds	475-7323

EPA Office of Water Enforcement and Permits

Enforcement Division:

Steve Martin, Chief, Compliance Information and Evaluation Branch	475-8313
George Gray	475-8313

Permits Division:

Ephraim King, Chief, Program Implementation Branch	475-9539
Tom Lafferty	475-9339
Harry Thron	475-9537

EPA Office of Enforcement and Compliance Monitoring

Water Enforcement:

David Drelich, enforcement summaries	382-2949
Toni Bandrowicz	382-2856
Bruce Rothrock, data base	382-2614

Roytech Publications and Dataflow Systems, Inc.
publish Chemical Sourcebook

Ken Clansky	301-654-9133

STATE PROGRAMS

California State Water Resources Control Board

Jesse Diaz, Chief	916-445-9552
Archie Matthews, NPDES program	916-322-4507
Ron Duff, Proposition 65	916-322-6990
Roger Johnson, land disposal	916-322-3732
Syed Khasimuddin, Proposition 65	916-324-5754

Colorado Water Quality Control Commission	
Paul Frohardt, Commissioner	303-320-8333
Colorado Water Quality Control Division	
Bob Shukle, Director, Permits and Enforcement	303-331-4758
Maureen Dudley	303-331-4597
Georgia Department of Natural Resources	
J. Leonard Ledbetter, Commissioner	404-656-3500
Environmental Protection Division	
Water Protection Branch	404-656-4713
Georgia Industry and Trade Department	
Louise Allen, Reasearch Division	404-656-7655
Illinois Environmental Protection Agency	
Water Pollution Control Division	
James B. Park, Manager	217-782-1654
Clark Olsen, regulations	217-782-1654
Steve Ewart, water enforcement	217-785-2760
Louisiana Water Pollution Control Division	
J. Dale Givens	504-342-6363
Maine Bureau of Water Quality Control	
Stephen W. Groves	207-289-3901
Terry McGovern	207-289-7774
Maine Economic and Community Development Office	
Office of Business Development	
Brian K. Dancause	207-289-2656
Massachussetts Department of Environmental Quality Engineering	
Division of Water Pollution Control	
Russell Isaac	617-366-9181
Michigan Department of Natural Resources	
Surface Water Quality Division	
Steve Roher	517-335-3300
Richard A. Powers	517-373-2190
Michigan Commerce Department	
Larry Tokarski, Business Climate Development Office	517-373-9280
Michigan Strategic Fund	517-373-7550
New Jersey Department of Environmental Protection	
Divsion of Water Resources	
Jeff Reading, industrial discharge	609-292-4860
Joe Reitzes, wastewater facilities	609-984-4429
James Hamilton, Asst Dir, enforcement	609-984-5855
George G. McLann, Director	609-292-1637

Arnold Schiffman, Administrator	609-292-1637
New Jersey Commerce and Economic Development Department	
Jane Morris, Financial Consultant	609-984-4442
New York State Department of Environmental Conservation	
Division of Water	
Dan Halton, wastewater facilities	518-457-6674
Bob Cronan, Section Chief, water compliance	518-457-6674
David Barolo	518-457-6674
New York Environmental Facilities Corporation	
Industrial Revenue Program	
J. Andrea Estus, Director of Finance	518-457-4414
General Programs	
Pickett Simpson	518-457-4414
Tennessee Department of Health, Division of Water Quality Control	
Barry Sulkin, manager water enforcement	615-741-7883
Bob Sladen, municipal water programs	615-741-2275
Division of Water Management	
Elmo Lunn	615-741-6600
Tennessee Business Assistance Center, Industrial Research	
Henry Tupis	1-800-251-8594
Texas Water Commission	
Clyde Bohmfalk	512-463-8412
U.S. EPA Office of Water Enforcement and Permits	
Permits Division:	
Ephraim King, Chief, Program Implementation Branch	202-475-9539
Tom Lafferty	202-475-9339
Harry Thron	202-475-9537
National Governor's Association, Washington, D.C.	
Jim Solyst	202-624-7739
Richard Hayes	202-624-5300
Association of State and Interstate Water Pollution Control Administrators, Washington, D.C.	
Linda Eichmiller	202-624-7782
Robbie Savitch	
Council of State Governments, Lexington, KY	
Steve Brown, environmental research	606-231-1866

ECONOMIC IMPACTS ON INDUSTRIAL SECTORS

EPA Office of Water, Analysis and Evaluation Division,
Economic Analysis Branch (conduct economic impact analyses for wastewater regulations)

Mark Luttner, Chief	202-382-5397
Mitchell Dubensky	

EPA Office of Policy, Planning, and Evaluation;
Economic Analysis Branch (prepare Cost of Clean Air and Water report)

Ralph Luken	202-382-5487
Brett Synder	202-382-3354

American Iron and Steel Institute

M. Young	202-452-7100

American Paper Institute

Patricia Hill	202-463-2420

American Petroleum Institute

Elden Rucker	202-682-8313

Chemical Manufacturers Association

Emily Currie, Manager Water Programs	202-887-1103
Margaret Montgomery	

Conservation Foundation

H. Jeffrey Leonard	202-293-4800

Edison Electric Institute

Carol Ruccio	202-778-6651

APPENDIX 2

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